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THE FOUNDRY TRADE JOURNAL IS THE OFFICIAL ORGAN OF THE INSTITUTE OF BRITISH FOUNDRYMEN; THE WELSH ENGINEERS' AND FOUNDERS' ASSOCIATION, AND THE FOUNDRY TRADES EQUIPMENT AND SUPPLIES ASSOCIATION.

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Pig-Iron Production.

One of the factors causing a certain amount of concern in the steel trade is the small size and output of the British blast furnace. Both American and Continental pig-iron outputs have increased since the war. In spite of the enormous handicap of the loss of the fields in Alsace and Lorraine, German pig-iron production has not suffered materially, while French production has practically doubled. Only the British output shows a decrease. Naturally enough this is linked up with the outputs per furnace, for the greater the output the less the production cost, and hence the greater the competitive power. A study of the figures shows that, while the largest British furnaces have an output almost equal to the German average, which in itself is over 50 per cent. above the French and Belgian averages, the average for this country is actually less than half the German average. Our average figure is less than a thousand tons a week and the German is over twice as much.

There is one aspect of this question that we desire to stress because, bad as our position is in this respect, there is one mitigating circumstance, and that lies in the production of foundry pig-iron. Those who argue about pig-iron production do not always specify that their enthusiasm for large outputs is concerned only with the steel-making variety or realise that, so far as foundry pig is concerned, large outputs may be a positive disadvantage. Something like one-third of the British furnaces appear to produce or to be able to produce foundry pig. Some of these furnaces are entirely unconnected with steel plants and must rely entirely on the foundry demand in order to dispose of their output. As we have hinted on previous occasions, the product of the large furnace, whether produced at home or abroad, is very tempting on a price basis, but founders engaged in the production of quality cast iron should seriously ask themselves whether it is in their interests that, in a period of economic pressure, the small furnace should disappear. Experience has shown that, once closed down, these furnaces are not readily brought back into commission. The skilled experience which has directed them ceases to be available, and the withdrawal of a well-known pig from the market involves many foundries in readjustments and tends to weaken the buyers' position in a competitive market. The position, of course, is a difficult one for all parties, and in the particular case of the statistical averaging referred to we suggest that the furnaces producing foundry pig—or at least those furnaces regularly and exclusively producing foundry pig—should be excluded from the averages, and those included dealing with steel pig. Foreign furnaces on foundry pig production are usually larger and fewer than those here, and purchasing is restricted accordingly.

Poaching.

It is comparatively easy to fill the order-books of the foundry industry, because it works for so many different trades, and when trade is bad it is very tempting to depart from one's normal productions and tackle work not normally undertaken.

For instance, some years ago, during the shipbuilding slump, some of the foundries catering for that industry decided to enter the textile engineering castings market. We doubt if they did themselves any real good, whilst they inflicted considerable hardship on the Lancashire foundries. Two other sections are constantly worrying each other, the builders' castings section and the light electrical goods. Another form of poaching happens when trade is good. During a motor-car boom, Coventry denuded Lancashire of moulders. Railway castings too often got deflected from shops specially laid out for their manufacture into all sorts of odd corners of shipbuilding and general engineering foundries. One of the most extraordinary examples of poaching we have encountered was in a very large ship-repair foundry served by a battery of really big cupolas which was attempting to manufacture delicate tobacco-machinery parts. The result was probably as disastrous for the buyer as the producer. One cannot adversely criticise the enterprise always to be associated with commercial poaching, but one must remember that, like its non-commercial counterpart, it is distinctly dangerous. If responsible people wish to indulge in a little pheasant or partridge shooting, they usually find it better for their pockets and reputations to make arrangements with people holding preserved grounds, especially if they themselves possess a "shoot" of their own. Obviously, the best solution to the problem of poaching would be an employers' federation covering every commercial activity within the industry, but, failing that, there should be some sort of co-operation between the existing federations to minimise the effect of ill-considered schemes of expansion to the general detriment of the industry.

The excuse usually put forward is that the retention of skilled men is an essential to the future conduct of a concern, but the taking of orders at cut-throat prices will immediately cause the dismissal of equally skilled men working in remunerative lines in other foundries, and impoverish the whole industry. If during trade depressions founders find it essential to add new lines, a real effort should be made to ascertain that no price-cutting is involved, and that their action cannot bear the stigma of "poaching."

XUM

Correspondence.

[We accept no responsibility for the statements made or the opinions expressed by our correspondents.]

Briquetting Cast-Iron Borings.

To the Editor of The Foundry Trade Journal.

Sir,—In The Foundry Trade Journal of July 24, 1930, I read the very interesting Paper of Mr. Fred J. Walls, presented at the annual Convention of the Institute of British Foundrymen.

About 20 years ago in Germany there was a considerable amount of work done in connection with the melting of briquetted borings, and I myself was experimenting a good deal in October, 1907, at the A. Borsig Works, at Tegel, near Berlin. There were two patented processes tried out. One inventor, Mr. Ludwig Weiss, of Budapest, claimed that the borings had to be moistened with limewater and mixed with powdered ferro-manganese to give good results, while the other, Mr. Ronay claimed that plain water would do, and he proved to be right. Manganese, nevertheless, was brought up to 0.75 per cent. in the mixture by adding ferro-manganese or pig-iron containing 4 per cent. of manganese.

Before applying briquetted borings, we used special high-grade cylinder pig-iron (cold-blast, "Frodair" and so on). Nearly all the railways in the country and abroad, ordering locomotives, specified 18 to 24 kgs. per sq. mm. (12 to 15 tons per sq. in.) for cylinder iron, and, to tell the truth, we had difficulties in meeting these specifications unless we used the cylinder pig-irons mentioned. After some experimenting, I started using a mixture of 10 per cent. briquetted steel borings, 20 per cent. briquetted cast-iron borings, 30 per cent. of German number 1 (about 2.5 per cent. Si and 0.1 per cent P) and 40 per cent. of cylinder heads for nearly all cylinders for steam engines, compressors and so on, and we came pretty close to the upper limit of the specification. But after some time something very strange would happen. One day the tests pulled 25 kgs. (16 tons per sq. in.), and, though the cylinders machined easily, we had considerable trouble to get them through inspection, as the upper limit was 24 kgs. and nothing more would be allowed.

After much correspondence and explanations and excuses the cylinders were admitted. But, alas, the next time the tests pulled 26 kgs. and nothing would prevent them from rising slowly up to 30 kgs. (20 tons per sq. in.).

To our surprise, however, the railroad companies were pleased to have such good cylinders. Then, after a short time, every foundry started melting briquetted borings, in spite of the fact that they were not good for everything, and, consequently, the prices of borings rose considerably so that no profit was possible. The process is now only used in very few German and Swiss foundries, where borings are cheap.—Yours, etc.,

M. Escher.

19, Turmbergstrasse,
Durlach.
August 12, 1930.

A good lubricant for lathe and similar centres can be made from powdered red lead and cylinder oil mixed to the consistency of cream.

Testing White Lead for Adulteration.—To ascertain whether a certain quantity of white lead is pure or not, adopt the following method:—Place a small quantity of the lead in a hole made in a piece of charcoal, and, using a blowpipe and a bunsen burner, direct a blue flame quite steadily upon the lead. If the white lead is pure, it will be reduced to a small but bright piece of metallic lead, but if impure no metal will be produced (due to the presence of zinc or barium salts).

The Iron and Steel Institute.

Autumn Meeting in Czecho-Slovakia, September 15-20, 1930.

In accordance with previous announcements, the Autumn Meeting of the Iron and Steel Institute will be held in Prague. The meeting takes place under the patronage of the Czecho-Slovak Government, and by kind invitation of the Society of Czecho-Slovak Engineers, with the support and co-operation of the Iron and Steel Industrialists of Czecho-Slovakia. The arrangements for the meeting have been carried out by an influential executive committee, the chairman of which is Dr. Vladislav Sykora, President of the Society of Czecho-Slovak Engineers, with Mr. J. Lubina as hon. secretary.

The sessions will take place at the House of the Society of Czecho-Slovak Engineers, on Monday and Tuesday, September 15 and 16. The subsequent arrangements include visits and excursions to the principal iron and steel manufacturing and engineering establishments in Czecho-Slovakia.

The following is the complete list of Papers to be presented at the meeting:—

(1) "High-Frequency Steel Furnaces," by D. F. Campbell.

(2) "Permanence of Dimensions under Stress at Elevated Temperatures," by W. H. Hatfield.

(3) "The Heterogeneity of an Ingot made by the Harmet Process," by A. Kríz.

(4) "A Contribution on the Constitution of the Fe-C-Si System," by A. Kríz and F. Poboril.

(5) "A Contribution on the Problem of the Analysis of Basic Slags and the Representation of their Composition in a Triangular Diagram," by O. Quadrat.

(6) "The Magnetometric Determination of the Curie Points," by A. Regner.

(7) "What Reasons compelled the Prague Ironworks to introduce Thin-walled Blast Furnaces," by J. Sárek.

(8) "The Effect of Contamination by Nitrogen on the Structure of Electric Welds," by L. W. Schuster.

(9) "The Quantitative Analysis of Steels by Spectrum Analysis," by F. Twyman and A. A. Fitch.

(10) "The Mechanism of the Solution of Cementite in Carbon Steel and the Influence of Heterogeneity," by E. Walldow.

(11) "Open-Hearth Furnace Steelworks: A Comparison of British and Continental Installations and Practice," by H. C. Wood.

Catalogue Received.

Steel Castings.—The third edition of the Steel Foundry Book, issued by Edgar Allen & Company, Limited, Imperial Steel Works, Sheffield, contains much additional matter to that contained in the second edition, especially in the section dealing with Maxhete heat and corrosion-resisting steel—a comparatively new development. When reviewing the second edition, we indicated that founders in general should regard this as a model catalogue, as it gives a real service to buyers and users of castings; it stresses the co-operation that has to be created between designer, metallurgist, patternmaker and moulder before a modern high-grade casting can be made. This edition runs into 51 pages, and is profusely illustrated. We suggest that the enumeration of the illustrations might be consecutive, the present arrangement is not orderly.

Babbitt Metal.—A reliable mixture for Babbitt metal for use in large bearings and other heavy duties is as follows:—88 per cent. tin, 4 per cent. copper, 8 per cent. antimony. For light work the amount of copper may be substantially reduced and the antimony also reduced slightly.

Random Shots.

I have been interested in following the arguments at the recent political summer schools, at which people are much more free to speak their minds than at ordinary party meetings. Mr. E. D. Simon has begun to cast doubt on a pure free-trade policy, pointing out that some sort of policy was required to enable us to recover our share of world trade. He tentatively advocated a 10 per cent. revenue duty on all imports other than raw materials.

* * *

Sir Walter Layton, the well-known economist, who was once Director of the National Federation of Iron and Steel Manufacturers and a convinced Free Trader, had no better consolation to offer than the fact that in a world of manufacturing nations we could not expect to maintain our one-time percentage of world trade. Mr. Henry Ford has been saying just the same thing in America, about America. Sir Walter firmly denied that the purchase of an American car in this country deprived British workmen of employment, since ultimately Americans were compelled to accept in exchange for the car goods which we were more fitted to make than cheap motor-cars.

* * *

The same conference produced an interesting clash of views on rationalisation. Mr. W. L. Hichens believes that, contrary to what obtained in the last century, production is ahead of demand, and that rationalisation is the effort made by industry to adjust itself to this condition until new inventions enable demand to catch up.

* * *

He argued that it was not intended as a cure for unemployment, but he did not push the argument to the usual conclusion that it would reduce it by lowering prices and thereby increasing demand. Mr. Angus Watson seemed to think that the overhead charges saved by rationalisation are only a small part of the cost of production and that it entails a loss by executive as against personal control. It standardises a product less good than the best, removes competition, and exploits the consumer by monopoly. He said that a product not a patent or covered by a monopoly or secret process could always be produced by private enterprise at a lower price than by a trust.

* * *

Then the survey made by the British Electrical and Allied Manufacturers' Association says that from American and German experience the principle of rationalisation is in danger, and that natural economic factors will persist in spite of all efforts to upset them. All of which is, of course, very confusing to the man in the street, but the main lesson to be drawn is the fact that the success or failure of a plan or scheme of any kind depends on the men who undertake it, and that what England most wants is real leaders in industry.

* * *

These should be young and fresh in outlook and able to plough fresh furrows rather than follow the old ones. Time was when the appointment of men to directorships in companies was regarded as a sort of trustee appointment by and for the shareholders. But these patient people could not have less done for them in many cases to-day. Many men of proper age for this were, of course, lost in the war.

* * *

Three things are basically wrong with us. Labour, by virtue of trade-union customs, is heavily protected. The wages in the so-called sheltered industries are too high. Finally, largely as a consequence of the second item, local and national expenditures met by the levy of rates and taxes are too high.

Marksman.

Ups and Downs in Lead.

FROM A CORRESPONDENT.

For some months past the lead market has distinguished itself amongst the other non-ferrous metals, which have pursued so persistently a downward course by a marked steadiness. Activity on 'change has been rather restricted, and the weekly turnovers have not given any indication of more than a passing interest, but quite a steady business has been done with consumers of this metal, who, although they have not covered far ahead, have, nevertheless, maintained a steady buying pressure. There is, of course, plenty of lead available, and ample reserves are warehoused in this country, but no attempt is made by sellers to create any artificial atmosphere of scarcity by limiting the tonnage offered, as happens only too frequently with copper. That values are supported by the "group" is, of course, true, but a very sane policy has been pursued and no attempt has been made to hold up the price when conditions have obviously indicated a decline.

As an example of how the lead situation has been handled, there was quite recently an advance in the American quotation to 5.50 cents, but practically no upward movement was seen on this side. As a matter of fact, within a few days the price in London reacted slightly, and it is probably a good deal safer to take a lead from the sterling quotation to-day than from cent values. No particular departure from the £18 level, at about which this metal now stands, is to be anticipated at present, and it will probably be some time before an upward movement is achieved. Confidence in the situation exists to-day, and it is no part of the "group's" programme to destroy such confidence by forcing an advance before the time is ripe and consumption on a heavier scale than it is at present. A continuance of activity in the cable-making industry during the present period of depression has undoubtedly been of a great assistance to the lead market, and has offset to some extent the lessened demand for storage batteries and other work. Within a few months the slack time in the building trade will be upon us, but with copper at its present price the cable manufacturers ought to be able to count on an expansion of trade.

Business in lead in this country has really been remarkably good, and market steadiness has been achieved because a genuine trade demand exists. Continental sales have perhaps been a little disappointing, and Germany is not taking metal at such a rate as formerly, but, latterly, Russia has come into the picture as a buyer and has taken a very considerable quantity. While a great deal of the lead imported into this country comes from the United States and Mexico, we also draw heavily upon the Empire for supplies. Canada, Australia and Burmah all contribute in varying degrees, and it is noticeable that while one consumer may display a preference for, shall we say, Australian brands, another favours the Canadian product. In this way a mild form of competition is created which is all to the good and keeps interest alive. As a matter of fact, Dominion brands rather stand in a class by themselves, and consumers will often pay a little more for such qualities.

In considering the lead situation, secondary metal must not be overlooked, for quite a big tonnage of remelted lead is turned over every year, especially in the United States. Much of this is dealt with on an exchange basis, the price being fixed at an agreed discount below virgin pig, so that disastrous price cutting of values is not seen. Lead has had its bad times when prices have been pushed up unduly and production has grown to unhealthy levels, but at the present time the barometer appears to be "set fair."

Recent Developments in Nickel Iron and Steel.

At a meeting of the American Iron and Steel Institute, held in New York recently, MR. CHARLES MCKNIGHT read a Paper on "Recent Developments in Nickel Iron and Steel," in the course of which he pointed out that from 1923 to 1930 the steel production of America increased by 22.46 per cent. The production of alloy steels increased in the same time by 65.88 per cent. But the production of nickel-alloy steels, gauged by the only authoritative index—sales of nickel to steelmakers—increased by 434.45 per cent.

Nickel Cast Iron.

The breadth of the field for nickel cast iron is indicated by such examples of use as automobile cylinders, brake drums, drawing and stamping dies, steel-mill rolls, locomotive cylinders and piston rings, machine-tool castings, Diesel-engine parts and aircraft-motor cylinders. One of the largest castings yet made of alloy cast iron was the large bell of a blast furnace.

Nickel in cast iron tends to refine the grain; to increase the machinable hardness; to increase the resistance to wear; to increase the strength; to reduce the chill and to eliminate porosity. When nickel is to be added to cast iron the other elements must also be controlled in order to gain the desired end. Small additions, 0.10 to 1.00 per cent., refine the grain of cast iron. Higher amounts, 3.0 to 5.0 per cent., may coarsen the grain if the silicon is not controlled. Nickel is like silicon, in that it assists in graphite formation and carbide decomposition, but there is a limit, roughly 3 per cent., beyond which silicon is detrimental to the iron. This is not true of nickel. Either silicon or nickel will tend to reduce chilling, but the addition of nickel causes no deterioration or loss of strength or increase in grain size.

Nickel improves the machinability of cast iron because it insures freedom from chilled areas and from hard spots. By its use, cast iron of 250 Brinell is as readily machined as ordinary iron at 200 Brinell. The hardening due to nickel is caused by an actual hardening of the iron matrix and not through action to increase the carbides in the iron. These valuable characteristics are exhibited by the addition of nickel alone in cast iron, but other alloys can be used to supplement the nickel; the most common one being chromium.

If the nickel and chromium content is raised and copper is added (nickel-copper-chromium), this cast iron will become austenitic, non-magnetic and resistant to corrosion. Such an iron is used generally where a corrosion-resistant cast iron is desired, as for soil-pipe and chemical apparatus. It is also used to some extent for castings which must be non-magnetic.

There has been a demand for a long time from certain sources for a duplex sheet or plate which would have a surface resistant to corrosion or chemical action backed up by steel to give structural strength. In the last year there has been developed such a material, having pure nickel to a thickness of 10 to 20 per cent. of the gauge on one surface of the plate. This nickel is welded and rolled on and only with difficulty can be separated from the steel. It is useful for tank cars for chemicals and similar uses.

Porous Pipes.—Cast-iron pipes of porous and open-grained metal may sometimes be saved from the scrap heap if the following procedure is tried:—Thoroughly clean the body of the pipe, removing all burnt sand and grit. Then wash the pipe with a saturated solution of hydrochloric acid (HCl) and iron borings. Then wash down with ammonia water and leave to dry naturally. In the case of large-bore, low-pressure pipes, the experiment is well worth trying, as the time taken is little compared with the cost of a new pipe.

Cast-Iron Pipes in Denmark.

In his report on the economic situation in Denmark, the Commercial Secretary of His Majesty's Legation at Copenhagen, states that in cast-iron pipes British firms find it difficult to compete, for German dimensions are standard for Denmark and British dimensions do not conform. British pipes are criticised as being too thick and, therefore, too heavy; their length is 12 ft., whereas the standard dimension is 4 m. This does not exclude British pipes, but adhesion to standard requirements might lead to an increased share of the market. One British firm is now manufacturing pipes in accordance with German standards and is securing orders, as it is also able to compete in price. Most British manufacturers (the exception being some Scottish producers) are now said to cast their pipes vertically unless they are "spun."

It is said that some Continental countries have reached a mutual agreement to divide the Scandinavian market in cast-iron pipes. The arrangement, to which France, Belgium, Poland, Germany and also Czecho-Slovakia subscribe, is believed to cover not only the question of quota allotments, but that of price as well.

The following are the imports of cast-iron pipes in 1929:—Germany, 4,915; Great Britain, 2,076; Belgium, 1,824; France, 955; and other countries, 20 metric tons.

The relative shares of German and Great Britain remained nearly unchanged compared to 1928. The import of fittings in 1929 amounted to 1,100 metric tons, of which Germany took as her share 1,036 tons. There is a small annual import of pipes under 6.5 mm. thickness (soil pipes, etc.), but British manufacturers get only a small share of the market. The dimensions are wrong. Of a total import in 1929 of 2,775 metric tons, Germany contributed 2,430, Great Britain 231 tons.

Publications Received.

Unemployed or Reserve, by MRS. M. A. CLOUDESLEY BRERETON. Published privately for the authoress by Messrs. Knapp, Drewett & Sons, Limited, 30, Victoria Street, London, S.W.1. Price 1s. post free.

The authoress makes a plea for the vocational training and cultural self-improvement of the adult male unemployed as a contribution towards the solution of the unemployment problem.

Commodity Markets.—The Swiss Bank Corporation, 99, Gresham Street, London, E.C.2, have prepared a 38-page booklet, which describes how commodity prices are fixed for most raw materials by reviewing the work of the metal, cotton, wool and all the other exchanges. Finally, there is included a table giving a comparison of the highest and lowest prices quoted in these exchanges for 1913-14, 1921 (slump year), 1928, 1929 and the price at June 30, 1930. With scarcely an exception, the commodities listed—sugar, coffee, cocoa, rice, rubber, jute, cotton, copra, copper, tin, wheat and maize—are down to 1913 prices, and one cannot fail to notice the discrepancy between these and the retail prices.

Polished metal surfaces may be protected from rusting and corrosion by smearing them with a heated mixture of equal parts white lead and tallow. Any acid which may develop in the tallow will be neutralised by the white lead, so that no corrosion is possible.

Economic Conditions in Persia.—The Department of Overseas Trade has issued a report on "Economic Conditions in Persia," dated March, 1930, by MR. E. R. LINGEMAN (Officer in charge of commercial affairs, British Legation, Tehran). This publication can be obtained from H.M. Stationery Office, Adastral House, Kingsway, W.C.2 (price 1s. 6d. net).

French Moulding Machines for Light Iron Castings.*

By H. Magdalenat.

The Société Bonvillain & Ronceray has produced a series of machines for moulding heating apparatus and thin castings in general, particularly the A.F. machines, which are either hydraulic or pneumatic. Their features are as follow: (1) Ease of working, as they have only one ramming piston and no stripping plate. This is effected owing to the *down-sand* frame; (2) the ramming is effected in a down-sand frame. It is therefore more effective at the joint than at the back of the moulding box, which is more rational; (3) the use of the down-sand frame permits of the use of moulding boxes with as many bars as the shape of the casting requires, provided they are cut tapered, and (4) they are very rapid. The ramming and stripping of a moulding box of any dimensions can be completed in 3 secs. from the moment when the box is filled to the moment when it can be removed by hand or by some lifting device.

The machine has also certain other accessory advantages. The moulding boxes used have bars. Mounted patterns need not be used, as the box rests on two rails, yet notwithstanding this a perfectly even casting of uniform thickness is obtained. Better venting is also ensured. The machines are used for moulding heating apparatus and all kinds of relatively flat and thin castings.

The illustrations accompanying this section were taken at the Hauts Fourneaux & Fonderies de Brousseval, where 45 moulds for 38-in. radiators are regularly produced per hr. with two men and one assembler (a boy). This output, considerable as it is, is capable of being greatly increased, in view of the fact that the sand is taken from the ground and the moulds are placed on an ordinary truck and not a mechanically-driven conveyor.

For the production of radiators these machines appear to be more effective than the sand-slinger

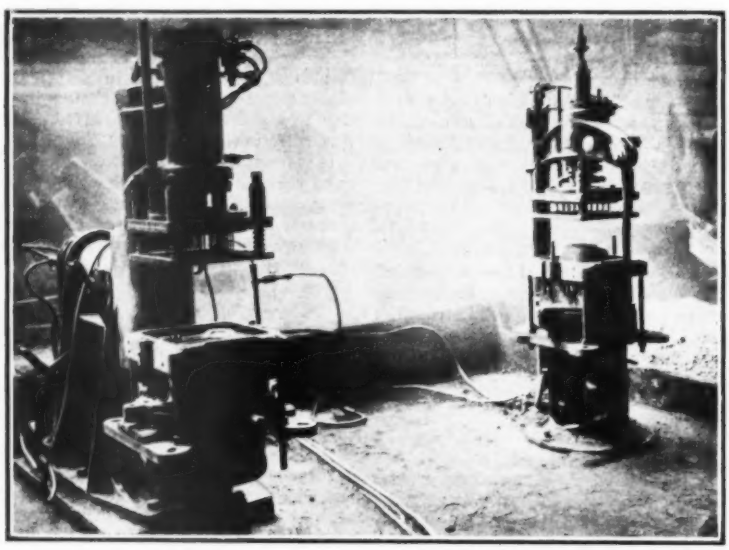

Fig. 1.—A Pair of Machines making Stewpan Castings.

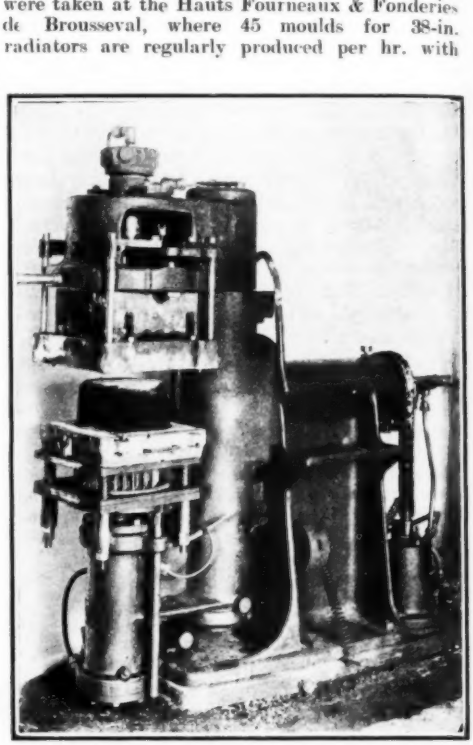

Fig. 2.—The Machine shown on the left of Fig. 1 but turned over and stripped.

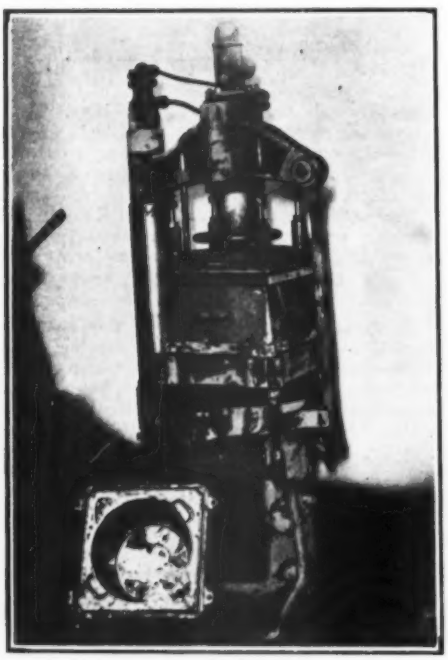

Fig. 3 shows the Machine on the left of Fig. 1 during the actual ramming. The Mould on the floor is complete with its two Runners.

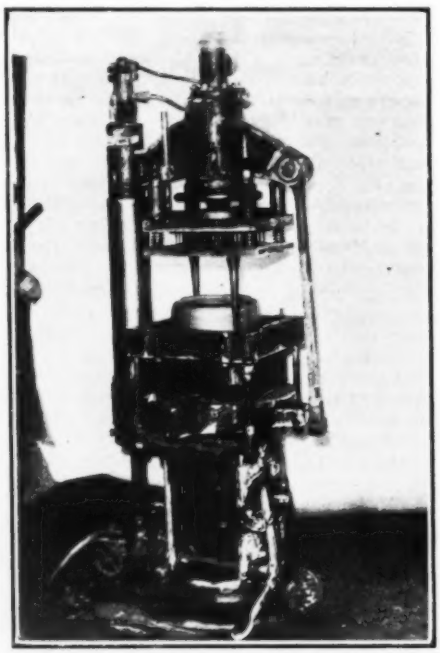

Fig. 4.—As Fig. 3, but ready for restarting.

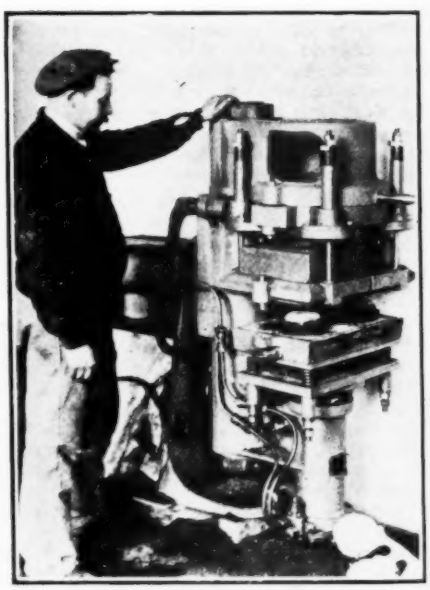

Fig. 5 shows the making of the Bottom Part of three Stewpans complete with Handles.

* Part of a Paper presented on behalf of the French Foundry Technical Association to the Middlesbrough Conference of the Institute of British Foundrymen.

type of machine for several reasons. The entire production of a foundry is dependent on a single impeller when the sand-slinger machine is used, while only five A.F. machines need be installed to obtain a similar output. One of these machines may be stopped, but the others continue working meanwhile. As the quantity of sand to be rammed in a mould is extremely small there is no necessity to use a machine capable of giving a large output of sand, as it can be better employed in the production of large castings made in small quantities. These machines also have similar advantages over machines of fixed dimensions. The down-sand frame has also led to the production of other castings of interest, such as 6-ft. fall-pipes and baths.

References to the various products accompany

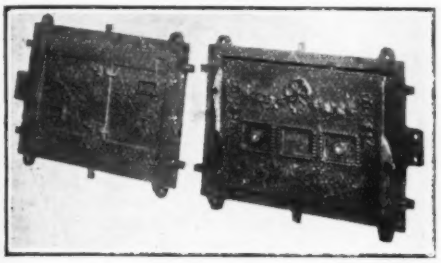

FIG. 13 ILLUSTRATES THE MAKING OF THE FRONT OF A MINUS STOVE.

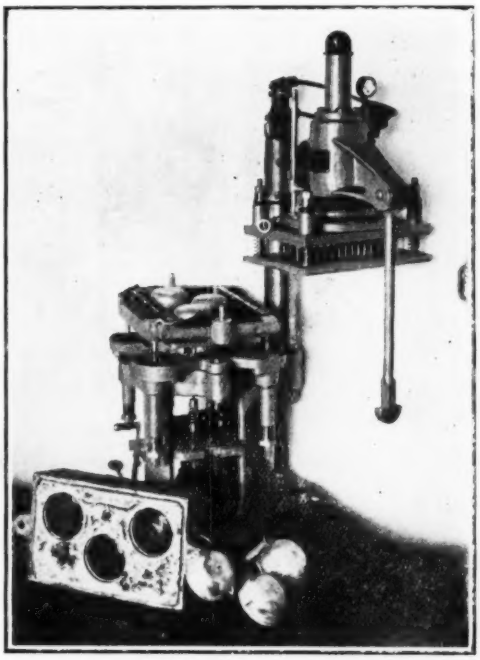

FIG. 6 SHOWS THE TOP PART AND THE RESULTANT CASTINGS.

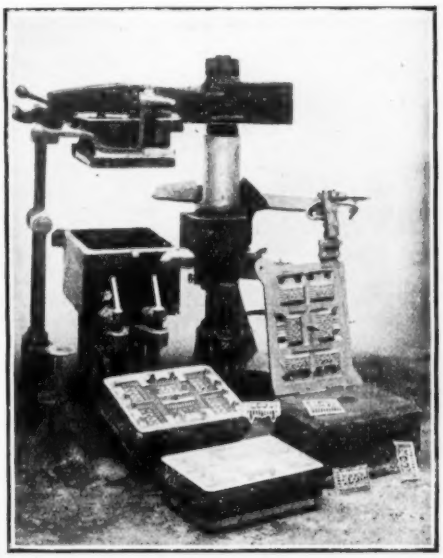

FIG. 11 SHOWS A MACHINE (D.F. 4 TYPE) ENGAGED ON THE MANUFACTURE OF SOAP-DISHES. IT MAKES 30 TO 35 MOULDS PER HR.

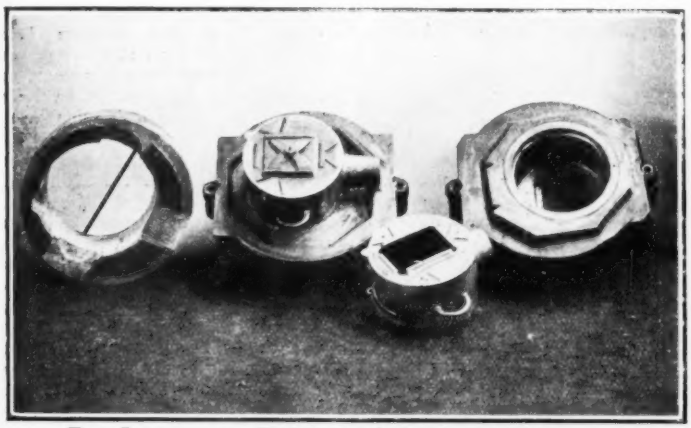

FIG. 7 SHOWS THE PATTERNS FOR AUTOMATIC WASHERS. THE MOULDING IS DONE ON A TURNOVER AND ON A FIXED MACHINE.

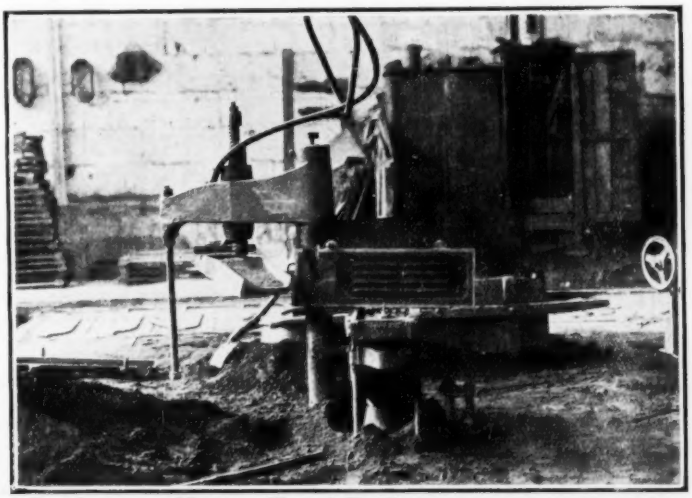

FIG. 8 SHOWS A MACHINE (TYPE A.F. 40) ENGAGED ON THE PRODUCTION OF RADIATORS. ITS PRODUCTION IS ONE MOULDING BOX PART A MINUTE.

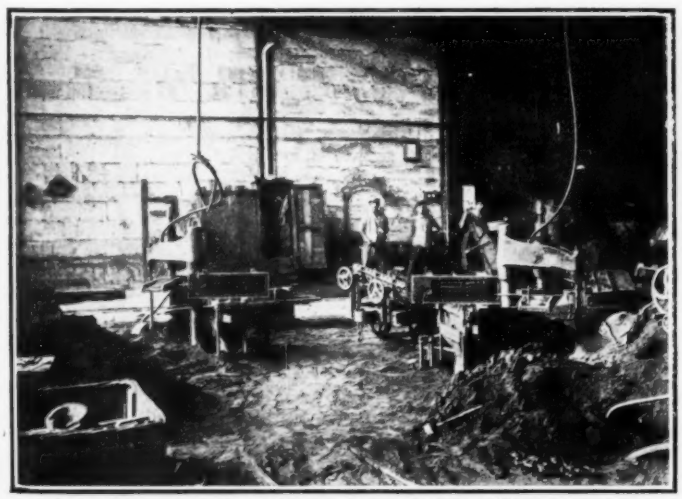

FIG. 9 SHOWS RELATIVE POSITIONS OF CUPOLA, MACHINES AND CASTING TRACK.

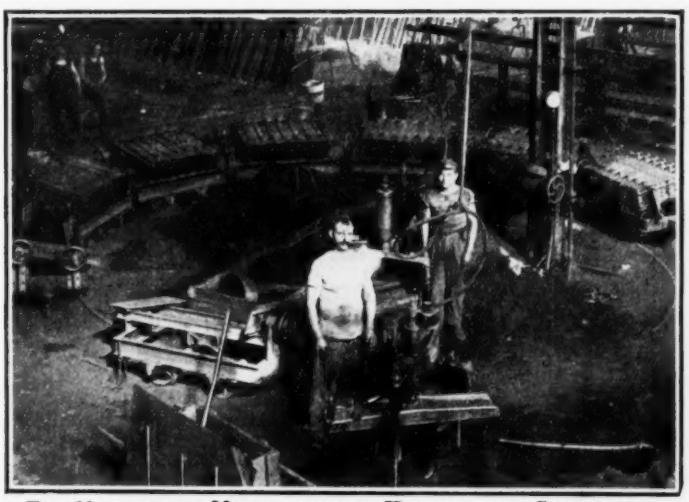

FIG. 10 SHOWS THE METHOD USED FOR HANDLING AND CASTING THE FINISHED MOULDS. THE LAST THREE PICTURES ARE TAKEN IN THE FONDERIES DE BROUSSEVAL.

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Fig. 12 shows a Machine (Type F. 4) making Ornamental Castings, using a Double-sided Pattern to eliminate Pins.

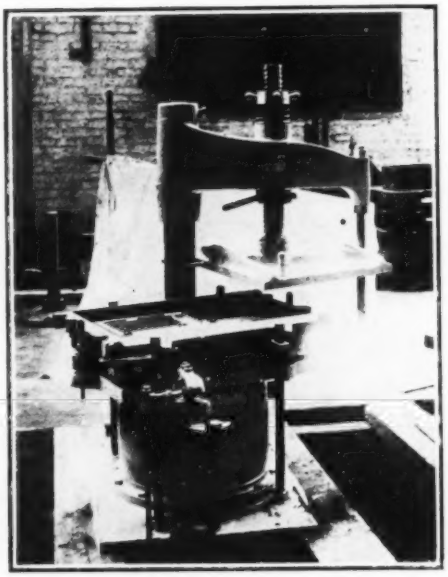

Fig. 14 shows an A.F.P. 40 Machine making small Gas-cooker Castings.

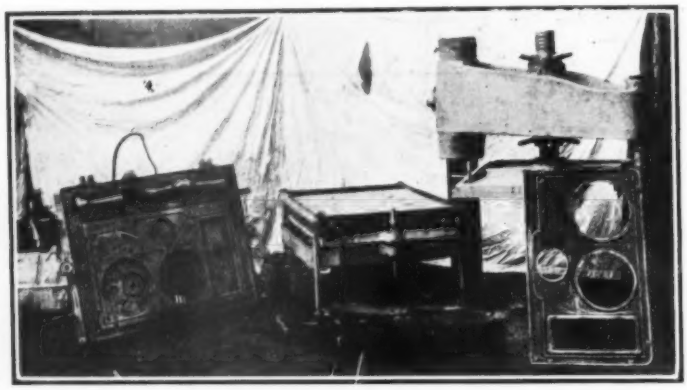

Fig. 15 shows a Machine (Type A.F. 70) making Kitchen-range Tops in Boxes 39 in. × 26 in. Its speed is determined by the Sand Supply and other Handling Conditions.

Fig. 16 shows the Moulding of Gypsy Pots on a Fixed Machine.

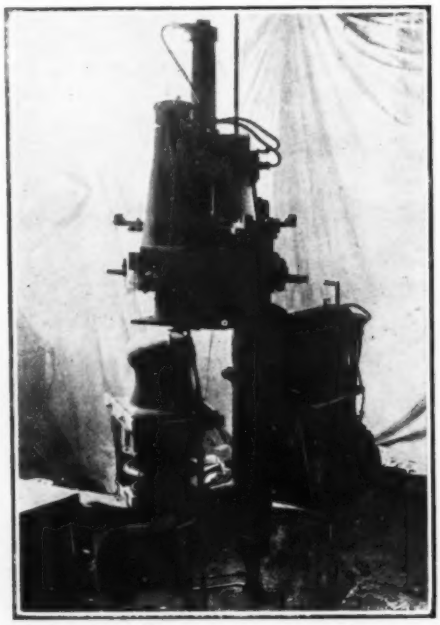

Fig. 17.—The Same Work as Fig. 16, but made on a Turnover Machine.

If suitably fed it can make a mould a minute. Several British firms have an output of 160 to 240 moulds for stove castings per 8-hr. day, without automatic feeding or continuous casting plant.

the illustrations. The machines for stewpots need only be mentioned in passing. They have been in extensive use for several years and are all equipped with the down-sand frame. Pedestal stoves, kitchen-range and gas-stove castings and the like have been made on Bonvillain & Ronceray machines. The skylight frames were also produced on them, chiefly at the Usines Nanquette at Saint-Michel and the Usines Genevée at Fréteval. Among the French firms using this plant for flushing tanks and similar castings may be mentioned Messrs. Gauthier at Voujaucourt, who mould them in green sand; the Pont-à-Mousson foundry, for the production of bends; and in England Messrs. Newton Chambers, who have machines with special modifications for their work, and the Camelon Iron Works, for bends and unions.

To show the time taken in moulding, a time-table was recently given in a Paper* by Mr. A. S. Beech relating to the production of rail-chairs. Chairs are more difficult to cast than stoves or kitchen equipment, and the times shown may therefore be taken as a basis for such castings.

As regards the D.F. 4 machine, which is specially suitable for flat castings, the following figures of production may be mentioned: the Midland Electric Company, 453 moulds per day of 8 hrs. This company has six machines of this type and is about to adopt a continuous plant to increase its production.

The German Iron Foundry Owners' Federation.

A general meeting of the German Iron Foundry Federation will be held at Eisenach on September 4 and 5. The meeting this year, on account of the economic position, is to be a strictly business one, no official invitation being given to the ladies.

On Thursday (September 4) morning, business meetings will take place, and in the afternoon, at 3.15, various Papers will be presented. Dr. Ascher (Frankfurt A/M) will present a Paper on "From Handwork to Continuous Casting Process." Another Paper will be presented by Ing. Guido Stern on "Continuous Casting Process and Power Consumption." A third by Prof. Paschke (of Clausthal) deals with "The Manufacture of Special Pig-iron and its Use for Foundry Work." One by Dr. Geilenkirchen will outline "The Economic Structure of the German Iron Foundries."

In the evening of the same day there is to be a festive gathering at the Wartburg Hotel to welcome members.

On Friday (September 5), in the morning, discussions will take place concerning the position of the various markets:—Jobbing Foundries, Foundries attached to Engineering Works, Raw Materials Markets (pig-iron, cast-iron scrap, coal and coke). In the afternoon, at 3 o'clock, a private meeting will be held at which the report for 1929 will be read, the auditors for 1930 selected, time and place for next year's meeting discussed; the Budget for 1930 and Sales and Delivery Conditions will be considered. At 4 o'clock the meeting will be open to the public, and Dr. Werner (of Düsseldorf) will present his report on "Progress Made." Awards will be made and a Paper will be given by Prof. Dr. Leidig (of Berlin) on "The Economic Position in 1929/30." At 7 o'clock in the evening there will be a social gathering of the members.

Messrs. Palmers Shipbuilding & Iron Company, Limited, have secured the contract for effecting permanent repairs to the oil tanker, "British Honour," which was damaged by fire in Sydney Harbour (Australia) in March last.

* Foundry Trade Journal, Vol. XL, p. 202.

Electric Welding of Mild Steel by the Metal Arc Process.*

By V. G. Pearson.

Electric welding has been the subject of much adverse criticism. Few of the arguments against it have been so damaging as the statement: "It all depends upon the operator." It is not fair to condemn welding because of a false impression that its success depends entirely upon the operator. By far the greater responsibility lies with the employers, who should choose their men carefully, train them properly, select the electrodes with judgment, and periodically test them to ensure that material and men are up to concert pitch. It is also the responsibility of the employer to prepare the work for welding in such a manner that difficulties during the operation are avoided.

It is generally admitted that, given a good operator, excellent work can be achieved. It is therefore the duty of those who have to decide whether or not the work shall be undertaken to satisfy themselves that the welders are good men. This point is beyond question so far as the Imperial Steel Works are concerned, and Edgar Allen & Company, Limited, are always willing to carry out investigations and to demonstrate that they can achieve what they claim. When considering the possibility of bad workmanship, it must not be overlooked that pride of craft is very much to the fore in this art, and that the keenness of welding operators is exceedingly great. Slovenliness should not be tolerated.

Because the work is hand work that is one reason why it is so good. As in other trades, the phrase "hand made" is often equivalent to excellence. Again, the art of welding is particularly adapted to the correction of an error; the operator knows when something has gone wrong, and he can always rub it out and do it again. It is quite true that one cannot see below the surface, but against that the surface itself is, to the expert, an excellent guide as to what quality can be expected. The same thing is not quite true of the welding of an alloy steel; but this article deals entirely with the welding of mild steel.

The two greatest possible evils of the welding deposit are porosity and slag inclusions. Dealing with the first, negligence on the operator's part can be ruled out. He has some control over the second defect, but not so much as might be thought, even though his training and periodical testing have been properly attended to. It is, as previously remarked, the responsibility of his firm to see that the work is carefully prepared before welding, and that the distance across the top of the "V" is approximately 1½ times the depth of the weld, although this will vary slightly according to the thickness. It is, however, most important of all to avoid steep walls where undercutting will take place, the ruling factor when preparing work for welding should be to make it as easy for the welder as possible.

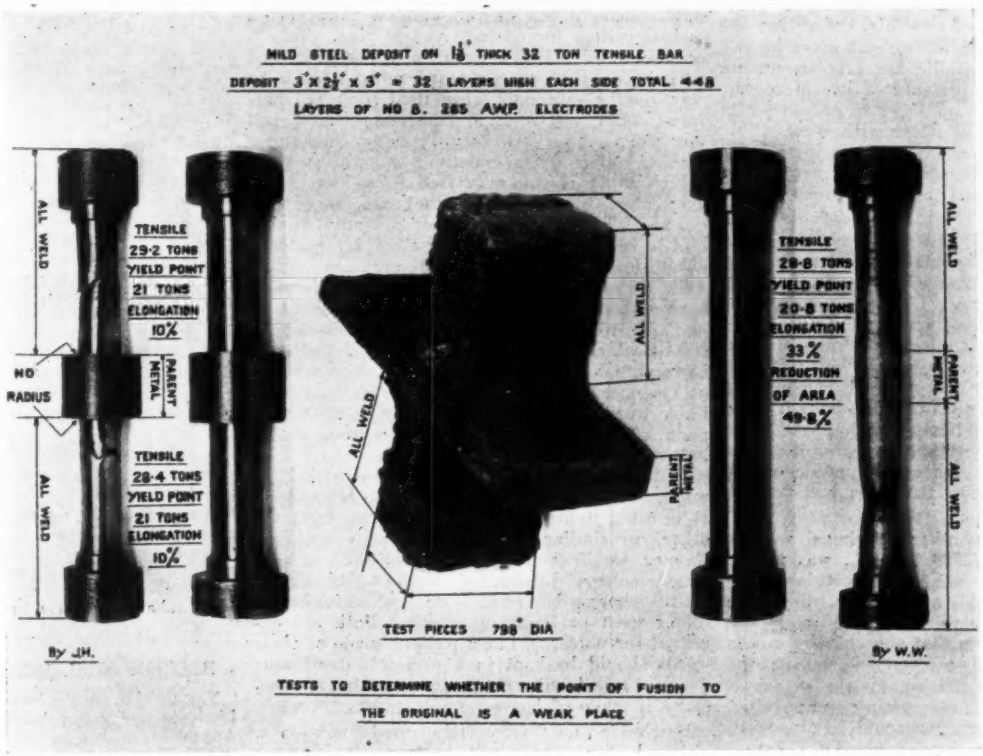

Fig. 1.—Showing Details of Tests taken to ascertain Strengths of Welded Unions.

Personnel Training.

The training of the operator is of paramount importance, and money spent wisely in the early stages of an operator's career will eventually yield an excellent reward. It has been said that a welding operator can be trained in a fortnight. This is utter rubbish. Nothing less than a month should be spent upon the A B C of the job, which is slag control. The work should be dealt with in easy stages, starting with the single run at an amperage higher than necessary for ordinary work, to facilitate the control of the arc. The current should then be reduced gradually to the correct amperage for the respective size of electrode. When straight lines can be produced without waviness or slag pockets, the next step is the joining up of line to line. Gradually a man will be able, stage by stage, to become proficient in the building up of layer upon layer, so that when the specimen is cut open and examined, there will be no sign of slag inclusion. It is my belief that an operator can be so thoroughly trained in the control of the slag that the correct procedure becomes second nature, so that it will be more difficult for him to carry on with the work, leaving slag pockets behind, than to have perfect control.

Patience in welding is an absolute necessity, and people too short-sighted to spend the necessary money on training their men certainly deserve all they get. Unfortunately, the bad work caused by such a policy brings welding into disrepute, and the innocent suffer with the guilty. Time spent in cleaning the weld is of vital importance, as the deleterious ingredients left behind will most likely be incorporated in the succeeding layer of metal, which will mean that the weld is not in the best condition.

A Board of Trade Welding Test.

In spite of many set-backs and the extremely conservative policy of British engineers, welding is making rapid strides in engineering science. I suggest that the time is ripe for the Board of Trade to take an active interest in the subject, and to set up a recognised standard, which would give more freedom to the efficient, and force other users of welding equipment either to attain the required standard or to go out of business. If firms could say that they were on the Board of Trade welding list, it would give greater confidence to engineers with authority to sanction welding, who may, nevertheless, not have had a training enabling them to decide upon this point with justice.

The author does not advocate a wholesale permission to weld being given, but it is annoying after years of research to see Government departments refuse to sanction repairs of a trivial character, which could obviously be carried out without hazard. There has been money

* Extracted from the "Edgar Allen News."

wasted over and over again through ignorance on the part of engineers as to the merits of welding. Instead of getting down to brass tacks and finding out what can be done, they are content to shelter behind that fallacy: "It all depends upon the operator."

Welding carried out at the Imperial Steel Works is under the strictest supervision; the operators are constantly tested to prove their ability, and to ensure that the welding materials are up to the standard. The success gained results in the firm taking a conservative view as to what it is safe to weld, because rather than impair the confidence gained, they would reject the work and not take the risk.

Homogeneity of Welds.

Some engineers, when considering the building up of hollow places in a casting, have expressed doubt whether the reinforced metal is homogeneous with the rest, and whether there is a possibility of its lifting off during a later machining operation. As to this, the author has never heard of a weld lifting out after having been made by the metallic arc process, during his fourteen years' experience of it. Moreover, he has often asked an engineer to endeavour to break a weld away, but never with success. As a fact, it is always found that the junction is the strongest place, in spite of the very slight penetration of the weld. This is probably due to the intermingling of the constituents when the surface of the parent metal is melted.

In order to take the matter a step further, and once more check results previously obtained, Edgar Allen & Company, Limited, deposited on to each side of two test-bars, 8 in. by 3½ in. by 1½ in., 224 runs, which formed blocks of weld 3 in. by 2½ in. by 3 in. A tensile test, 0.798 in. dia., was then turned out of one specimen from one extremity of the weld to the other; if what is so often considered likely had happened, the test-piece would most certainly have broken close to the parent metal, either at one side or the other. Fig. 1 will show that this was not the case.

In regard to the other specimen welded, another tensile test, 0.798 in. dia., was turned out, but the parent metal was left larger in diameter than the weld, being 1¾ in. dia., with dead sharp corners where it met the weld. The illustration again shows that the point of fusion at the parent metal was by no means the weakest place. Upon cutting up the welds for testing purposes, both after sawing and turning, no porosity or slag inclusion could be discerned, and yet these welds were made by different operators. Any of the firm's operators can do the same thing, and good results could be guaranteed no matter how many times they were tested.

Piecework Welding.

In conclusion, the author would like to stress the importance of the heavily-coated electrode, and the great necessity for patience with the operator. To give welding work of any importance out on piecework terms to the operator is foolish. There is a given time in which the electrode should melt, and it cannot be forced. If piecework were adopted, the deposits would not be de-scaled as they should be. It takes as long to de-scale a run and brush away all impurities as it does to deposit the rod, yet herein lies the secret of success or failure. To those who have authority to say whether welding work should be carried out or not, it is suggested that they give a sympathetic ear to the claims made for welding. If they are in any way doubtful, they should have tests carried out as near to the working conditions as possible. They will be surprised and pleased with the results.

The 3rd Annual Convention of the Grey Iron Institute is to be held on October 8 in Cleveland, Ohio.

Timber and the Pattern Shop.

By "Vallishe."

Good patterns cannot be produced with timber of inferior quality. Most patterns demand good timber, but it is doubtful how many patternmakers can really discriminate between good and bad. The selection and quality of timber should form part of the patternmaker's training during apprenticeship, but beyond learning the rudimentary points his knowledge of timber is incomplete. Without doubt there are exceptions to the rule, but, generally considered, the statement is closer to the truth than is sometimes imagined.

The most suitable timber for a certain type of pattern should always be carefully considered. In many cases this point is practically ignored, and the pattern in question, instead of standing up to the average wear and tear, is ruined before it has given its maximum service. Certain patternmakers are of the opinion that spruce is better than the average yellow pine. This is questionable. Although spruce is easily worked it is often very open-grained and is liable to warp badly, especially when used for small patterns. Dry yellow pine, free from heart, will not warp under ordinary foundry conditions. Again, yellow pine (sometimes known as Weymouth pine) is generally free from knots, and even when these do occur they are, as a rule, dead. White pine is another splendid timber and is recommended by the author for patterns of unusual shape; it also holds glue remarkably well. The above must not be confused with spruce deal (also known as white pine), which is hard, whereas the former, better classed as New Zealand white pine, is quite soft and even in texture. Spruce deal is often used on account of its cheapness, but has many faults. It is liable to twist and to contain cavities filled with resin. For high-class patterns this wood should be avoided.

Canary wood is sometimes confused with basswood, and in many instances this can be excused. It is often difficult to distinguish one from the other, so similar are they in many respects. Canary wood, however, is usually of a pale lemon colour, intersected with parts almost white, whereas basswood is of a yellowish-brown colour with parts almost green. Both are excellent for patterns, but a pattern made of these woods should be kept in a perfectly dry room; dampness will ruin the pattern entirely, especially if made of basswood.

Beech is not frequently used nowadays, although for very small patterns it is occasionally favoured. When dry, beech can be blown through—a test which is often used. It does not, however, necessarily follow that the timber is unseasoned if the test fails; a straight-grained piece will generally satisfy such a test.

Teak should always be examined carefully before buying, as it is not unusual to find soft dry parts amongst an otherwise good piece of timber.

Baywood (Honduras mahogany) is ideal for most classes of patterns. It is straight-grained, easy to work, free from knots, does not warp or shrink (any more than is practicable), and keeps its shape after use remarkably well. Few patternmakers know how to cross-cut a board of baywood. The saw should be held parallel with the surface about to be cut, so that the entire width is cut at the same time. Failure to do this may result in the board being split for some distance on each side of the cut.

Some patternmakers use African mahogany (known under several different names, according to shipment) instead of baywood. It is cheaper in price, but nevertheless it cannot usually compare favourably with a good piece of baywood. It is liable to shakes and is very absorbent. One advantage, however, is that it can be obtained in large sizes. The best quality comes from Lagos. Gaboon mahogany should be avoided.

When the various defects and peculiar characteristics of timber are considered, it is surprising to find patternmakers jointing different kinds together. In some cases, perhaps, no ill-effects result from such a practice, but as a general rule it should be avoided. It is really quite interesting to see an expert selecting and testing various kinds and classes of timber. The ticking of a watch should be heard from one end of a log to the other if in good condition. "The heavier, the stronger," holds good for timber of the same class.

In conclusion, although one cannot expect the average patternmaker to possess the knowledge of a timber-man, he can certainly benefit himself considerably by studying the various classes of timber.

Continental Steel Cartels.

As a result of the steady reduction in the production of the groups embodied in the Continental Steel Cartel, the question of the financial penalties is stated to have become acute. The penalties have not been abandoned, but owing to German complaints some time ago the margin of the production subject to the fines for excess output was diminished. At that time it was apparently not reckoned that the production would be so abnormally restricted and the market so depressed as at present. In the meantime the output of the various groups has been so largely decreased that scarcely any money is now being paid into the equalisation fund.

The collapse of the distribution offices for bars, plates and hoops has caused the suggested agreement with the Dutch merchants to become untenable, but the convention with the Swiss merchants remains in force in so far as concerns semi-finished material and shapes. Moreover, the convention with the English merchants is said no longer to exist, although the pool for semi-finished material is being carried through.

Wire Rod Syndicate.

There is said to be no foundation for the reports circulated concerning an impending dissolution of the Continental Wire Rod Syndicate. Nor has the sale of wire rods in Belgium and Luxemburg been thrown open to free competition. The present agreement of the syndicate runs until the end of next year. The next meeting of the managing committee is to take place early in September.

BELGIAN SEMI-PRODUCTS CORPORATION.

The Semi-Steel Products Corporation of Belgium, Limited, was registered as a private company on August 11, with a nominal capital of £10,000 (9,500 "A" or preference shares of £1 and 10,000 "B" or ordinary shares of 1s.), to deal in semi-finished steel products and manufactures of Belgian origin, and to carry on the business of manufacturers of and dealers in pig-iron, steel bars, etc. The first directors are Messrs. Honore Dubar (managing) and A. Corin. The registered office is at Staple House, Chancery Lane, London, W.C.2. The formation of this corporation is a sequel to the decision to establish central selling offices in London for the sale of semis on the British market. It is understood that the new corporation will handle the sales of all the Belgian makers outside the Ougrée Marihaye concern. The corporation and the Ougrée company will each have its allotted tonnage, which in the former case will be distributed by the corporation among its constituent works.

Modern Steel Castings.—In the course of an article of a recent issue of "The Iron Age," Mr. C. B. Harrison states that the present integral cast-steel locomotive bed is indicative of the great advances that have been made in the art of steel moulding in the last 20 years. The present construction does not present any new principles; the construction consisting in general of a girder formed of longitudinal and cross members in a single piece instead of being built up of separate pieces. Cast-steel tender frames are in many cases over 40 ft. long, 10 ft. wide, and weigh about 15 tons each. Their adoption has practically eliminated tender frame failures.

Utilising British Pig-Iron Resources.

COMPOSITION AND PHYSICAL PROPERTIES.

In the discussion on "The Economic Utilisation of British Pig-iron Resources," a Paper presented by Messrs. C. H. and N. D. Ridsdale to the Middlesbrough Conference, many prominent experts expressed their views on inherency and allied problems. It was opened by Mr. J. E. Fletcher (consultant to the British Cast Iron Research Association), who first voiced the appreciation of all foundrymen for the comprehensive list of pig-irons which had been given. Foundrymen, he said, appreciated the fact that the Paper had been presented by Mr. Ridsdale and his son; the names of the late Dr. Stead and Mr. Ridsdale were very closely connected, and it was well known that Mr. Ridsdale had had a very long experience of this subject.

Steel Mixtures and All-Mined Pig-Iron.

The reference in the Paper to the value of British all-mined pig-iron was worthy of very serious consideration. In the Cleveland area one of the most remarkable series of pig-iron that the world had ever known had been manufactured for many years, and those who had studied the manufacture of Cleveland pig-iron realised that for many years its reliability had been unequalled. The recent tendency to displace natural pig-irons by mixtures of steel and pig-iron presented a problem which was occupying the minds of foundrymen, especially those who were called upon to make the high-duty irons, the making of which demanded something which the Cleveland pig-iron did not contain—and in this connection he was not speaking of the hematite pig-irons, but the natural pig-irons of the district. Experience had shown that there were some dangers connected with the use of mixtures of steel and certain kinds of all-mined pig-iron. No doubt there were many present who would support him in the contention that, if a founder wished to make cast iron of a certain analysis, he would be well advised to use pig-iron having an analysis very similar to that which was required in the cast iron, and this matter of getting a pig-iron with an analysis similar to that of the cast iron to be produced, without having recourse to material which was not pig-iron, was worthy of very serious consideration.

Close Pig-Iron Analyses Worth While.

Some of the furnaces which had for many years made ideal pig-irons were going out of action, because the types of pig-iron they were producing were being ousted by other products which contained steel; many foundrymen were in difficulties because they could not get the ideal pig-irons produced previously and had to try to imitate them by so-called refining and by using mixtures of steel and iron. It was worth while considering very closely whether they should encourage blast-furnacemen to make irons having analyses very close to those of the castings desired, or whether they should spoil the iron producers' trade by using something else, and which was not all that they would like it to be. The making of cast iron was not quite the same as the making of cast steel. When making cast steel, they took practically all the impurities out of the material before getting the analysis required. In making cast iron, however, it was simply a question of the mixture that would give an average analysis, and he cautioned foundrymen to pay rather more attention to the point that an average analysis was not the same thing as an analysis which was a true average of the pig-iron used.

Inherent Properties Supported.

Mr. F. J. Cook (past-President) endorsed Mr. Fletcher's remarks. The old-fashioned furnaces were dying out, he said, and foundrymen were having to substitute products very widely different in composition and mix them in order to get the same results as were obtained previously with the old-fashioned pig-irons; if they could obtain pig-irons having analyses very similar to the ultimate analyses desired in the castings, and so avoid the very wide variations in composition, the better it would be for the resultant castings. The authors had referred to that wild, erratic hare, the problem of inherent properties, but had been wise enough not to chase it too far. He believed that some of the old-fashioned irons did possess qualities which were not indicated altogether by the chemical analyses of the metal. It was unfortunate that the first table in the Paper (No. 4) related to an iron which, so far as he knew, had not existed for a very long time. The Capponfield furnace was one of those which, when started up a couple of years ago, had produced very good iron—something akin to the old-time Staffordshire iron—and he had hoped that it would have continued to do so, but he believed that it had run for only a few months. He mentioned the matter because the remarks in the Paper might lead foundrymen to go to considerable trouble in order to obtain an iron which did not exist.

Punchings Unsuitable as Raw Materials.

With regard to the addition of steel to the cupola, the authors had referred to punchings as being useful material. His own experience, however, was that one should avoid putting punchings into a cupola because, owing to their small size, they trickled through the spaces between the coke and got into the oxidising zone, and were more likely to cause hard spots than anything he knew of.

Using the Tables.

The tables at the end of the Paper, showing the irons available, would no doubt be of great use to all members of the Institute; although they were in the nature of catalogues, and, therefore, their contents must be accepted very cautiously, as the authors had pointed out, they did, however, give an indication of the classes and the analyses of the irons available in different parts of the country. In 1906, Parker had carried out a quantity of work in this connection, but the Institute had not sufficient money at that time to be able to print all his results. There was some very useful information by Parker published in the 1912 "Proceedings" however, which, when read in conjunction with the information given in the Paper by Messrs. Ridsdale, would be of very great use to the members. The only difficulty was that very often founders whose businesses were not large enough to enable them to employ chemists would regard the analyses given as being literally true. Anyone with experience of taking pig-irons from a furnace, however, knew that it was impossible to produce a number of irons of absolutely identical analysis, and in the ordinary way the average analyses of the different consignments would vary very widely. Therefore, if the members would regard the figures given in the Paper as indicating the types of iron produced in the various districts and did not accept them too literally, they would find them of very great use.

Refined Irons.

There was a good deal of misconception with regard to refined irons. Some people considered that they had only to melt 10 cwts. or a ton at the end of every day's blow and pour it into pigs and they had then refined it. Iron treated in that way was not by any means refined, and if iron so treated was accepted as being refined, the users were very likely to have trouble.

One great advantage to the small ironfounder in connection with refined irons is that the makers of this class of material did supply to guaranteed chemical analysis, and in most cases supplied, if asked for, the analysis of each consignment.

Speed and Quality.

Mr. J. H. Cooper (Darlington) pointed out that, when considering the analysis of iron, one sometimes overlooked its physical properties, and he asked whether, as the result of forcing furnaces too much, the physical properties of the iron were apt to be very much depreciated. Again, when comparing the analyses of the different charges from a particular blast furnace, one sometimes found that there was a great difference as between the first portion of the cast and the last portion. He asked the authors whether the iron taken from the blast furnace in the early stages of the tap was better than that which came out in the later stages, and if the iron were harmed by remaining in contact with the coke at the bottom of the furnace at a temperature of approximately 1,500 deg. C.

Cold-Blast Iron.

Mr. A. Campion said that he wished to express his appreciation of the enormous amount of work performed by Messrs. Ridsdale in the collection and tabulation of the data contained in the Paper. The authors had referred to the difficulties which arose through the misuse of the term "Cold-Blast Iron." He agreed that difficulties unfortunately did arise through the application of the term to material which had no claim to be cold-blast iron in the true sense of the term. Many so-called refined irons, which were simply mixtures of steel and scrap, were designated by the sellers as "cold-blast iron," and, unless users were very careful to differentiate between such irons and those made in the blast furnace from all-mine ore with cold blast, they might experience very considerable trouble.

Steel Additions and Hard Spots.

The authors had also made reference to the melting of steel in the cupola, and the fact that some people were afraid of steel additions on account of the production of hard spots in the castings. He thought that that was an erroneous view, as there was no difficulty in melting steel in the cupola provided that the conditions were properly controlled. His view was that hard spots were not due to the addition of steel, but to unsuitable melting conditions. The great secret of making steel mixtures in the cupola was to have the cupola properly under control; that was, adjustment of air supply, suitable coke ratio and everything else properly proportioned. If that was done, he believed that it was impossible to produce hard spots. He himself had never found hard spots in steel mixtures melted under properly-controlled conditions, even when using as much as 80 per cent. steel.

Ferro-Manganese to be Avoided.

With regard to the additions of manganese, his experience in the production of high-strength cast iron was similar to that of the authors in the manufacture of basic Bessemer steel, viz., that a better result is obtained by using a high-manganese iron than by the use of an iron low in manganese and then adding ferro-manganese. He always preferred to use a highly-manganiferous iron, and if that were not available, and it was necessary to add extra manganese, he used a low-grade spiegeleisen rather than ferro-manganese charged with the pig-iron. The addition of ferro-manganese to the ladle was to be avoided, as the results were always less satisfactory than when the additions were made in the furnace.

In conclusion, he thought that the Institute was greatly indebted to the authors for the valuable collection of data contained in the Paper, and which would be a valuable one for reference purposes. He would like to utter a warning to those who might refer to the tables when in

search of an iron suitable for a particular requirement. The tables showed types of iron, and should be used to find sources of a type of iron rather than iron of exact analysis; by that he meant the tables indicated which were, say, high silicon or high manganese, with, say, high, low or medium phosphorus, and so on. He mentioned this because he had known people taking advertised figures for the purpose of calculating cupola charges where the composition of finished castings were required between certain limits and being surprised that the results differed widely from what had been expected. It was then, he thought, necessary to emphasise the fact that the tables did not replace analysis of each consignment.

Pig-Iron for Ingot Moulds.

Mr. E. Longden asked the authors what range of manganese they recommended for ingot moulds. With regard to semi-steel, he had melted many thousands of tons of metal but had never experienced any more trouble from hard spots than obtained from other cast-iron mixtures. There were many reasons for the production of hard spots in cast iron other than by the use of steel. Commenting upon the authors' reference to the pouring of surplus cast iron into ingot moulds, he asked whether they noticed any depression or sunken places on the top side of the ingot. He was confident that no depression or shrinkage cavity would be disclosed. He had made many tests and experiments with cast iron, and more recent experiments had convinced him more than ever that liquid shrinkage in grey iron was almost negligible if correct mould conditions were obtained. For instance, in the case of a border-line iron as used for chilled rolls, it was common practice to feed the moulds over a very long period. But he had recently poured a chill roll, weighing 35 cwts., through a top filter gate, and no attempt was made at feeding. Contrary to expectation, a casting was secured free from shrinkage cavities of any kind. This casting was experimental and was broken up for careful examination.

Definition of Cold-Blast Iron Wanted.

Mr. John A. Smeeton, discussing the authors' reference to cold-blast pig-iron in relation to refined iron, asked whether the term "cold-blast pig-iron" referred to the melting of virgin ore in a blast furnace, blown with cold air, or whether the same term could be applied to virgin ore similarly melted but afterwards remelted and refined in a semi-open-hearth furnace for the purpose of obtaining a particular analysis-specification. In other words, whether cold-blast pig must be melted from virgin ore without the inclusion of any steel or scrap of any kind.

Authors' Reply.

Mr. C. H. Ridsdale, replying to the discussion, said he was glad to know that most of the speakers did not appear to be afraid of hard spots in steel. He had not expected, nor had he desired, to suggest that there were no physical differences between certain types of iron which we had not yet accounted for. He did not make the statements in the Paper as an authority on the subject, but merely wished to make foundrymen think and thrash out these various problems in their own minds. What he wanted to emphasise was that, whether we liked it or not, progress would continue to be made; in the course of his lifetime he had encountered many difficulties which it appeared would not be surmounted, but which had proved ultimately to be surmountable as the result of proper study, and he wished to emphasise that all founders would have to consider their problems carefully, because they had to compete with people who would find means of surmounting the difficulties, and who would make successful castings with steel mixtures, having physical qualities just as good as those of the special irons. Such results would not be obtained, however, unless one acquired the art of regulating the conditions properly; it was a very intricate problem, and each would have to think and work it out very carefully if he were to be successful. He knew quite well that one never obtained quite the same result with what was called a doctored steel as with one which had plenty of manganese in it from the beginning, but that was probably due to our lack of experience and an insufficient study of the problem.

Replying to Mr. Longden's question as to the range of manganese recommended for ingot moulds, he suggested a manganese content of about 0.8 per cent.—though, again, he did not wish to be regarded as an authority. His experience was that if the manganese content were too high there was a tendency to cracking.

The question put by Mr. Smeeton was just the sort of question which he could not answer wholly. He looked to the expert cold-blast iron makers to give an absolute definition of cold-blast iron. Certainly he understood it to be an "all-mine" iron made in the blast furnace with cold blast, and not some other kind of iron, perhaps a hot-blast iron, melted in a cupola with cold blast; that distinction should be borne in mind.

Mr. N. D. Ridsdale, commenting on Mr. Cook's statement that the Capponfield furnace had been closed down, said that the firm which controlled the iron from this furnace had given the authors the analyses of Capponfield iron, and they had assumed, therefore, that that iron was obtainable.

Replying to Mr. Cooper's question as to the effect upon the physical properties of the iron of forcing the blast furnaces, he said he did not know whether the iron from the earlier part of the cast was better than that from the latter part of the cast, but he did not see why it should necessarily be better or worse, though it might be different in composition. When it had got down to the well it was not in particularly intimate contact with coke, as was the iron in a cupola, which latter was constantly dripping through the coke.

Mr. Cooper said he had asked the question because he had seen certain analyses recently which indicated great variations in the iron at different portions of the tap; the physical properties of test-bars made of iron obtained at different portions of the tap were also very different.

Mr. C. H. Ridsdale said that, if the composition differed, naturally the properties of the iron differed. In the first Paper read before the Middlesbrough Branch he believed he had stated distinctly that not only did different parts of the same cast differ, but different parts of a pig differed.

Mr. Cooper said there was a general idea that iron would readjust itself, so that it would all become of uniform quality when there was a large body of it.

Mr. C. H. Ridsdale agreed that some people held that idea, and recalled that in the early days of steel-making, some 50 years ago, it was thought that, because steel was molten, the steel in one part of a ladle, ingot or rail must be exactly the same as the steel in any other part. That was not so, however.

Mr. N. D. Ridsdale, replying to Mr. Cook's reference to the addition of punchings to the cupola, agreed that one was well advised to avoid that. As to the use of ferro-manganese, he would always avoid using that if he could without getting the carbon too high, and use a lower-grade alloy such as spiegeleisen, or possibly manganese-steel scrap—another cheap way of adding manganese.

Replying to Mr. Longden's question concerning manganese in ingot moulds, he suggested that the work carried out by the British Cast Iron Research Association recently on the effects of manganese should have some bearing on that. That work had shown that in order to get the softest iron the manganese content should be something like 0.3 per cent. in addition to that required theoretically to combine with the sulphur. Thus, if one had, say, 0.1 per cent. of sulphur, one should use sufficient manganese to combine with that sulphur, plus another 0.3 per cent. The problem had been dealt with in a Paper by Dr. Norbury a year or so ago.

The President, in thanking the authors for their Paper, said that its preparation had involved a tremendous amount of work, and he assured them that in producing the Paper they had rendered the Institute a very great service.

Refined Pig-Iron Supplies.

Mr. G. T. Lunt wrote that the remarks by Mr. F. J. Cook on the subject of Capponfield pig-iron did not fairly state the actual position. While it was true that the furnace was blown out about a year ago, supplies had been available from stock right up to the present time. Unfortunately, it was no uncommon experience in this country for blast furnaces to work intermittently, and for years past the productive capacity had been in excess of the demand. When the foundry trade fully realised the advantage of using old-fashioned qualities of pig-iron, produced under slow melting conditions, it would be able to obtain supplies from Capponfield and from furnaces of similar type.

Bottom-Pouring Ladles.

Mr. Frank Hudson wrote that the authors in this Paper had made a valuable contribution to our knowledge and put before us data invaluable for future reference. He was particularly interested in that portion relative to the calculation of charge mixtures, and would like to know *what were considered to be the dominant factors.* He noticed that the specimen calculations included T.C., Si, Mn, P and S. Personally, he had always based calculations on Si, Mn and P only, as it had been found that the amounts of T.C. and S, present in the final melt were primarily affected by melting conditions and could only be obtained consistently uniform by experience and perfect cupola control. This, of course, was of vital importance when working with mixtures containing steel. There was no doubt that the correct melting of mixtures containing steel was difficult, but he could not agree that it was very difficult to make high-duty iron castings only occasionally, as excellent results could be fairly simply obtained by the use of special refined irons. The use of these special refined irons would certainly be more economical than to install an electric or other type of furnace, and if a foundryman could not control his cupola, then it was up to him to learn, as he was sure, before the electric furnace was mastered, the defective castings would be enormous. He was also interested to note that the authors did not recommend the covering of low-carbon metal with carbonaceous material for fear of carbon absorption.

It appeared to him that in recent years too much stress had been laid on low-total carbon, and it was his candid opinion that no high-duty grey-iron casting need contain less than 3.2 per cent. T.C. if the other elements were in satisfactory proportions.

In conclusion, he accentuated the authors' remarks relative to the use of bottom-poured ladles. These ladles were invaluable for high-duty castings, as they precluded any likelihood of slag entering the casting, and it was surprising that they were not more generally used.

Mr. J. G. Pearce wrote that the information given in this Paper would be of considerable value to the industry, and in particular the inclusion of figures for the range as well as average analyses would be helpful. The magnitude of the tables drew attention to the necessity for standardising the order in which the elements of cast iron were reported. Some years ago the Cast Iron Research Association decided to standardise the following order:—Total carbon, graphitic carbon, combined carbon, silicon, manganese, sulphur and phosphorus, followed by

(*Continued on page* 133.)

Custom and Usage.

CARELESS AND DEFECTIVE WORK.

By a Barrister-at-Law.

Points as to Custom or Usage.

The Lancashire weaver's case, in which judgment was reserved and has now just been delivered by an eminent High Court Judge, is a notable one for several reasons. It is true that the claim of the weaver, the plaintiff in the action, against his employers, the defendants, who are manufacturers of cotton cloth, amounted only to 1s., but the case raised important points in relation to workers' wages and the right of employers to make deductions under the Truck Act, 1831, and the Factory and Workshops Act, 1901. The question was whether there was any justification for the defendants either to deduct the shilling from the wages or to deduct it in calculating the wages, and the plaintiff took proceedings to get a decision in the matter. The case was called on last March, and, after an adjournment for the amendment of the defendants' pleadings, there was an exhaustive hearing, when a large number of legal authorities were referred to and discussed, the learned Judge deciding to reserve judgment after an elaborate argument on either side. In view of the fact that among other matters the question of custom or usage was raised in the case, the decision now given is of unusual general interest. On the point of the alleged Lancashire usages it was contended that certain facts had to be considered. In the first place it was submitted that it must be asked whether there was any general practice throughout Lancashire, and, in the next, did the plaintiff know of it? Then the further inquiries must be made: Did the practice amount to a usage or custom, and, was the practice certain, reasonable and universal?

The Presumption.

It may first be desirable, so far as it is possible within the necessary limits of a short article, that a few observations should be made upon certain general principles of the law on this subject. The usage of a trade or of a locality may be proved, and by such evidence a term may be annexed to a written contract or a special meaning may be attached to some of its provisions. Oral evidence of a usage which adds a term to a written contract is admissible on the principle that "there is a presumption that in such transactions the parties did not mean to express in writing the whole of the contract by which they intended to be bound, but to contract with reference to those known usages." For instance, by commercial usage there is a warranty of seaworthiness held to be included in a contract of marine insurance, although not specially mentioned. Further, a tenant may sometimes by custom have certain rights on the ground that the parties have contracted with reference to that custom and an implied contract has been thus created, notwithstanding that there may be nothing in a lease to that effect. Those acquainted with agricultural matters will not need to be reminded that this has frequently occurred in the past in the case of farming tenants, with reference to the custom of the country as to their rights on giving up possession of their farms.

The Principle.

But oral evidence of usage to explain phrases in contracts, whether commercial, agricultural, or otherwise subject to known customs, is admissible on the principle that "words perfectly unambiguous in their ordinary meaning are used by the contractors in a different sense from that. In such cases the evidence neither adds to, nor qualifies, nor contradicts the written contract; it only ascertains it by expounding the language." Both this principle and the presumption previously mentioned are founded, of course, upon case law with a line of legal authorities following it.

Evidence Relating to Charter-Party.

Take the case of a charter-party in which the days allowed for unloading the ship are to commence running "on arrival" at the ship's port of discharge. If by custom "arrival" is understood to mean arriving at a particular spot in the port, evidence may be given to show what is commonly understood to be the port. Two things are, however, required in order that a usage proved in this way may enlarge or explain a contract. It must be consistent with general rules of law, and it must not be inconsistent with the terms of the contract. It must be remembered, of course, that no usage can prevail against a rule of our common law, or of an Act of Parliament. Moreover, it is open to parties to exclude the usage either by express terms or by framing their contracts so as to be repugnant to its operation. To this it may be added, perhaps, that the usage of a society to compel its members to carry out contracts avoided by statute may constitute a risk against which the person employed to make such contracts is indemnified by his employer, where both knew of the usage. It may be also pointed out that related to the principle that usage may explain phrases is the admissibility of skilled evidence to explain terms of art or technical phrases when used in documents.

A Uniform List of Prices.

In the course of the case now decided it was put that if the plaintiff knew that his engagement was to be in accordance with the usages existing throughout the cotton trade in Lancashire, it could only be unreasonable if contrary to justice. Further, it was submitted that if he did not know of the practice it must be such as not to alter the contract between the parties, but to provide means of carrying it out. The defendants claimed to deduct the shilling in dispute in respect of 3 yds. of cloth in which it was stated a fault had been found, and they alleged that the engagement of the plaintiff was to be in accordance with the usages mentioned. A uniform list of prices was agreed upon for different cloths by the manufacturers' and workers' associations, the parties being members of their respective organisations. The list referred to was contained in a book which was supplied to the employee, and the rate of wages depended on the inspection by a "cloth-looker" of each piece of cloth as it was completed to decide whether it contained any defect.

A Penalty for Carelessness.

In his judgment in the present case the learned Judge referred to the fact that there had been a practice in the cotton trade in Lancashire for many years for employers to make deductions from wages for bad work, and that this was proved beyond doubt by many witnesses, the practice being widely known to all persons connected with the trade. This was obvious from various attempts which had been made by the operatives to get rid of the system. Bills, remarked his Lordship, had been brought into Parliament for that purpose, and in the Factory Act, which made fines illegal, the weaving trade was expressly taken out of the statute; but from the evidence it appeared that the practice of deduction for bad work did not prevail in all mills, for in 15 per cent. there was no such practice. It was said, continued the learned Judge, that by the alleged usage the deductions could never exceed the loss actually suffered, but, in fact, the amount of the deduction was fixed before it was possible to ascertain the actual loss, as it was not known in what way the merchants would deal with the cloth. The deduction, he added, was not really for the purpose of making good any loss, but as a penalty for carelessness. In his Lordship's opinion, such a practice was not a usage which the law would recognise.

No Usage Proved Recognised by Law.

The learned Judge held that the alleged "usage was neither reasonable nor certain, because it was precarious, depending on the will of the master. It was left entirely to the discretion of the master to say whether the work was bad, whether the fault was the fault of the weaver, whether there should be a fine or not, and what the amount the fine should be. The defendants stated that if the weaver objected he could take steps, through his trade union or the County Court, to have the matter put right. That did not afford a good answer to the contention that the custom was not certain. The deduction made by the defendants was a deduction from the wages and not a deduction in calculating the amount of the wages, and the deduction was clearly illegal under the Truck Act, 1831." There could be no justification in law, observed his Lordship, for the deduction except under the alleged usage, and, as in his judgment, there was no such usage proved as the law recognised, there could be no justification for the deduction.

Employer Entitled to Dismiss for Bad Work.

In regard to the defendants' arguments that the wages payable were for merchantable cloth only and that the plaintiff could not recover in respect of three yards which were not merchantable owing to his alleged negligence; and that the defendants were entitled to deduct the loss which they suffered owing to the plaintiff's failure to exercise reasonable care and skill, the learned Judge confessed that he had some difficulty in understanding what was meant on the first point, as a proportionate deduction would be less than a shilling. His Lordship, however, was satisfied on the evidence that the employer was entitled to dismiss a weaver for bad work, but that so long as he remained in the employment the weaver was entitled to be paid for work done, whether the cloth was merchantable or not. In relation to the further point submitted by the defendants that, apart from any usage, the plaintiff must have agreed to be employed on the same terms as the other operatives in the mill, who were subject to liability for deduction, the learned Judge found that there was no evidence of any such term in the contract between the parties. These findings left the question of usage as the remaining and substantial issue to be decided in the case. His Lordship dealt with this important matter as already mentioned, the plaintiff was held to be entitled to the declarations which he sought, with an order for payment of a shilling, and the defendants were ordered to pay the costs of the action.

Horse-Power of Leather Belting.—This can be estimated by multiplying the width of the belt in ins. by the speed in ft. per min. and dividing the resultant by the following factors:—Heavy double leather belts, 380; light double leather, 500; and single leather, 675.

Manganese in Steel Rails.—Discussing the subject of manganese in steel rails, Mr. Bradley Stoughton, Lehigh University, Bethlehem, Pa., states that high manganese in the old Bessemer rails was intentional and not the result of recarburising. He also advances the theory that the reason for the high strength of medium-manganese steels is due to the sorbitic rather than the pearlitic structure formed.

XUM

Moulding of Pedestal Stoves.*

By H. Magdelenat.

The total height of this stove, which weighs 28 kgs. (61 lbs.), is 72 cm. (29 in.), whilst the diameter of the main body is 24 cm. (9½ in.). The stove is shown erected in Fig. 1, whilst in Fig. 2 the various component parts are illustrated. They are, taken from left to right and from top to bottom, the three feet with their bolts; the air-supply cover and its two casting bolts; the rings and cover plate; the top cover; the body of the stove; the ash pan, door and grate. In this article only the body of the stove will be dealt with, the metal pattern for which—split into two parts—being shown in Figs. 3 and 4. Fig. 5 shows the accessory pattern material, A being the core box for the flue; B the pattern for the flue; C, bottom of pattern; D, pattern of bottom section (metal pressing) to be placed over the core of the stove in order to obtain the opening in the body beneath the opening for the air supply. This opening, shown in Figs. 1 and 2, permits the entrance of air beneath the grate. E, wooden false pattern, which is placed in the interior of the pattern during the ramming of the sides and enabling the sand to be packed into the hollows of the pattern corresponding to the door of the stove and the ash-pan opening. F, wooden pattern for the runner.

Fig. 1.—The Assembled Stove.

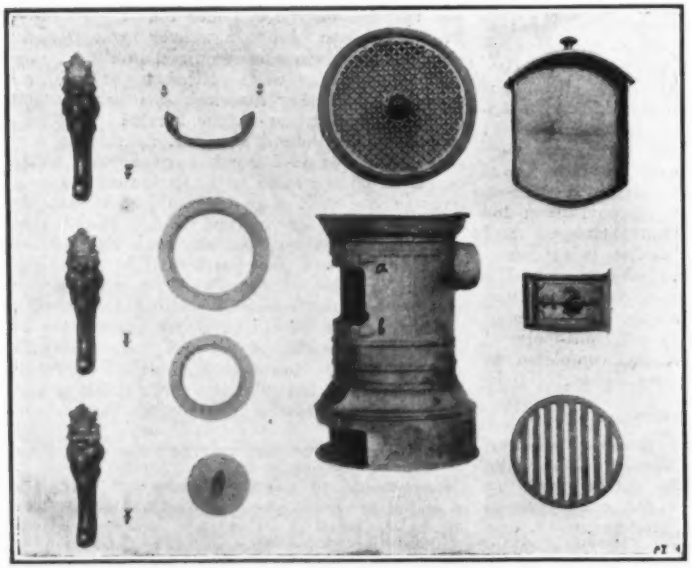

Fig. 2.—The Component Parts of the Stove.

Fig. 6 shows the moulding box used. It is in four parts:—A, bottom part; B—C, two sides; D, top part. Fig. 7 illustrates the moulding box set up in pouring position. Note the various handling devices:—Two handles for the upper part, which can be carried by one man; four lugs (offset vertically) for each side to enable it to be handled by two men.

The different methods of assembling the parts of the moulding box; studs and cotters for assembling the top part with the sides, and the sides with each other; hooks and staples for fixing the bottom to the sides, and permitting of setting-up laterally, are clearly shown.

Method of Moulding.

The body of the stove is top cast at the bottom, *i.e.*, it is turned upside down.

The moulding comprises the following operations:—

Moulding of the Sides.—The two half-patterns, connected together and to the bottom C, Fig. 5, are centred within the two sides B and C, Fig. 6. The whole is placed on a wooden board; the pattern for the outlet flue B, Fig. 5, is put in place and also the wooden false pattern E, Fig. 5, in the interior of the body pattern for the purpose of stopping the openings for the door and ash pan. During this operation the stove is in its normal position.

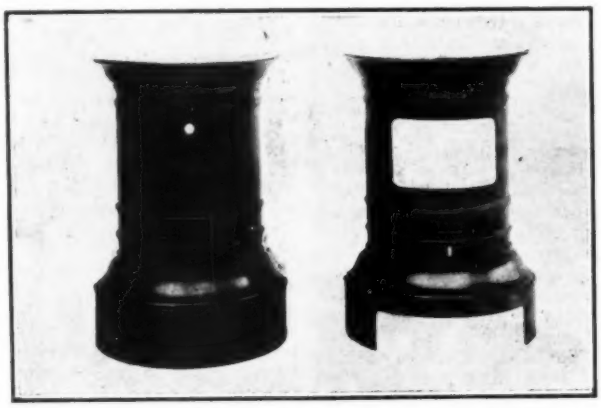

Fig. 3.—Metal Patterns for the Body.

The sides are rammed and the lower joint AB, Fig. 7 (which is now above), and those for the door and ash pan are made; to make these two latter joints the wooden false pattern E, Fig. 5, is removed and the inside of the body pattern is sleeked.

Moulding the Body.—The lower part A, Fig. 6 (the stove is still in its normal position and this lower part is, therefore, placed on the side), and the core is rammed; the vents are made and the sides and the lower part are turned over on the casting board in the final position shown in Fig. 7.

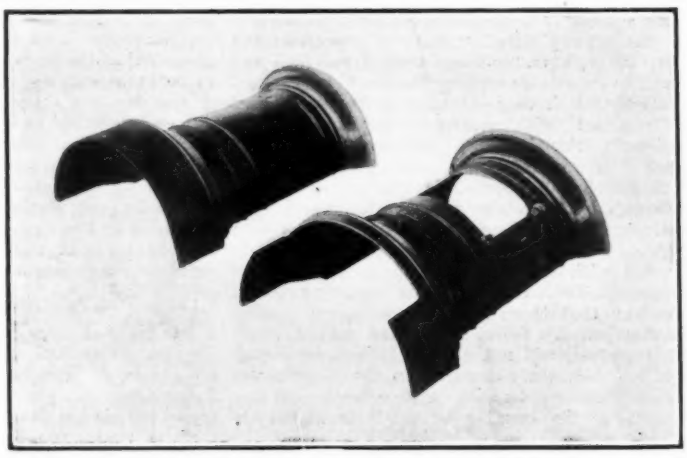

Fig. 4.—Metal Patterns.

Moulding the Top Part.—The lower joint CD, Fig. 7, is made, and the upper part D, Fig. 6, and the runner pattern F, Fig. 5, are placed in position; the top part is rammed. The top part is then removed, the sides are vented, the bottom pattern C, Fig. 5, is drawn and the part is assembled.

* Part of a Paper presented at the Middlesbrough Conference of the Institute of British Foundrymen on behalf of the French Association.

Finishing the Core.—The two sides are taken out, the widened section pattern D, Fig. 4 (shown in this figure in the reverse position to that which it actually occupies on the core), is

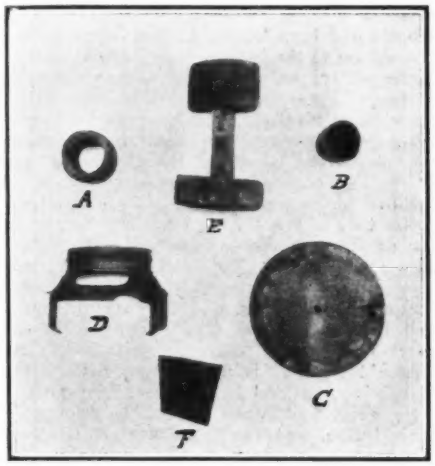

Fig. 5.—Auxiliary Pattern Parts.

placed over the core, the wider section corresponding to the hollowed-out part in the pattern is rammed and the core is set

Finishing the Sides.—The two joints EF, Fig. 7, are made, the two half-patterns are drawn, the sides are finished, blacked and sleeked; the flue-outlet core is rammed (core box A, Fig. 5) and put in place, together with the cores corresponding to the sockets for the door pins (A, B, Fig. 2).

Summary.—These various processes constitute the 12 basic operations enumerated below, which occupy 69.68 min. To these may be added the preliminary operations: sifting the sand (4.40 min.), heating the pattern and preparing the moulding box (2.50 min.); and the final operations: pouring (1.32 min.), stripping (6.76 min.), preparing the sand (4.40 min.) and chapleting (7.93 min.), which occupy a total of 96.99 min.

No.	*Basis Operations.*	*Time.*
1	Setting up pattern, placing sides ...	3.91
2	Ramming sides, placing outlet flue...	7.02
3	Making joints for bottom, door and ash pan	2.89
4	Placing bottom part and ramming core, venting, turning over ...	8.34
5	Making top joint, placing top and runner and ramming top part ...	4.33
6	Lifting top, venting sides, drawing bottom and finishing	3.22

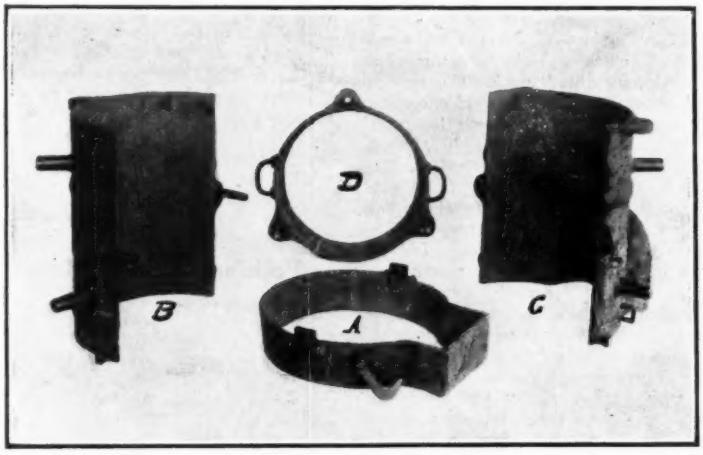

Fig. 6.—The Moulding Box Used.

Fig. 7.—The Moulding Box set up for Pouring.

7	Withdrawing two sides, placing boss for air post	7.42
8	Setting core	3.39
9	Making side joints, drawing pattern, finishing, blacking and sleeking ...	18.44
10	Ramming and placing core for flue outlet and cores for door	4.29
11	Setting up sides and clamping ...	3.05
12	Securing top part, cutting the runner, cleaning and closing ...	3.38
	Total	69.68

Steel Structures in Canada.—The second edition of the Standard Specification for Steel Structures for Buildings, issued by the Canadian Engineering Standards Association, shows some radical changes. One of these is raising the permissible unit stress in tension from 16,000 lbs. (7.14 tons) per sq. in. to 18,000 lbs. (say 8 tons). The other unit stresses have been correspondingly increased. The column formula and the standard allowances for snow on roof and wind have also been revised.

Iron Trade Review.—The Penton Publishing Company of Cleveland, Ohio, U.S.A., have discarded the name "Iron Trade Review," and, beginning with the issue of July 3, 1930, the publication which has carried that title for nearly 50 years appears under the name "Steel." The old name was chosen at a time when iron was a dominant influence in the industry. That influence no longer exists. Iron has been supplanted by steel. Hence the change in the name of the publication.

Utilising British Pig-Iron Resources.

(*Continued from page* 130.)

other elements, such as nickel and chromium. Thus, the two direct carbon determinations were given first, followed by their difference. Manganese and sulphur were so intimately associated that they were best given together, and phosphorus, which was the most isolated element normally present, was given last. While no particular virtue was claimed for this order, much mental energy would be saved if agreement were reached on a particular order.

The tables showed that, in spite of economic difficulties, causing the closing of a number of old furnaces, no country in the world had such an unrivalled variety of pig-irons from which to choose. Another very significant feature was that out of some 57 producers recorded as operating, no less than 13 were producing, or were prepared to produce, refined iron; four firms were producing it exclusively.

Recognising the importance of co-operation between the blast furnacemen and the iron-founder, stressed by the authors, the Cast Iron Research Association some months ago established a Pig-iron Sub-Committee, with the formation of which every pig-iron producer in the Association was in cordial agreement. Carefully-considered research would doubtless throw much light on vexed questions, raised by the authors, still awaiting solution, and in this connection the Research Association had already advanced an important step by demonstrating that the properties of cast iron did not depend wholly on composition and thickness and that different structures were obtainable from irons of the same composition.

AUTHORS' WRITTEN REPLY.

Messrs. Ridsdale, replying to Mr. Hudson, wrote in reference to the dominant factors that what they meant primarily was, any factor which was either specified within certain limits or which experience showed should come within them. The mixture of iron must be such as when melted under the conditions of the particular works practice should give this. After this was provided for, there was generally a certain range of latitude within which the subsidiary factors could be adjusted. But, to take Mr. Hudson's own instance, it would be useless, where the total carbon must not exceed 3 per cent., to start with a mixture which would give no less than 3½ per cent., as would often be found to be the case unless liberal additions of steel were used. He quite agreed that, even when enough steel was used, unless the cupola working was properly controlled, the melted iron might still come out over 3 per cent.

But it was precisely this that they were trying to preach throughout their Paper, viz., that every foundryman responsible for results must first study what it was he needed to make, and then, by experiment and practice, gain the experience that would give him the control with his own plant—and substantially Mr. Hudson himself had said this further on. Unless he gained the mastery in this, he might make a mess of things, even with special refined iron; quite possibly, for instance, in the matter of casting temperature.

Good high-duty iron, to suit many of to-day's requirements, might be, as Mr. Hudson said, made with 3.2 per cent. total carbon, but it was none the less vital that a good foundryman should be able at will to make it with only 3 per cent. or even only 2.5 per cent. It is interesting to note that Mr. Hudson apparently confirms the authors' recommendation as to avoidance of covering low-carbon metal with carbonaceous material, and gives strong support to the use of bottom-poured ladles.

Order for Reporting Elements.

Replying to Mr. Pearce, as to the order of elements standardised by the British Cast Iron

(*Continued on p.* 134.)

XUM

Insurance for Transits.

ROAD, RAIL AND WATER REQUIREMENTS.

By J. W. Parker, A.M.Inst.T.

In its insurance requirements for metals and manufactured goods in transit, the foundry trade presents a greater variety of needs than most other industries. In the case of low-grade iron, no matter what its particular state, insurance demands are at their very lowest since the material is virtually undamageable in the ordinary way, nor is it liable to theft or pilferage. At the other end of the scale, one may take brass, copper, lead or most of the non-ferrous varieties and find any of these dangers to be considerable if for no other reason than the market value of the commodity being so much higher. So far as railway and ocean carrying are concerned, the main points of insurance liability have long ago been settled either by custom or by legal test actions, so that the position does not give rise to quite the same degree of misunderstanding as in the case of road conveyance. As really the latest entrant into the carrying field, long distance road transport is often carried on with a disregard for the elementary business practices which is nothing short of alarming. The entirely unorganised state of the haulage industry is doubtless responsible for the laxity which exists, and the presence of extensive rate cutting is also responsible for insurance being neglected in the case of smaller and newer concerns which find it imperative to cut all costs to the bone. It is only fair to say that the bigger and more reputable road haulage concerns invariably carry full insurance, and unhesitatingly pay all damages with an enviable promptitude, realising as they do that such a policy ensures the continuance of cordial relations with the trading public. It is the man who is cutting rates in a desperate attempt to keep his head above water who is tempted to make the doubtful economy of not taking out insurance cover on the goods in his charge. It only needs a single accident to end his career, but unfortunately that particular mishap may have serious consequences to the trader as well. The safest way is to insist upon all goods being insured, but where casual lorries are necessarily hired, it may easily happen that an occasional load is overlooked. If, however, the industrialist takes out a floating policy of his own on the understanding that the insurance company will meet any claim not settled by the lorry owner, one can rest assured that all practical measures have been taken.

Road Accidents.

On the general point of liability for hiring road transport, an interesting case was recently decided in the High Court of Justice. The question for decision was whether hirers of a road vehicle were really responsible for damage caused by their temporary servant, the motor driver, and consequently whether they should have undertaken the necessary insurance or not. A firm of builders was in the habit of hiring a motor lorry from a haulage contractor, and on the particular occasion the hirers loaded the vehicle with machinery, and in the course of the journey an arch under an aqueduct was encountered, through which the driver attempted to go without first ascertaining whether there was enough clearance. As it happened, the headroom was insufficient and the load was jammed, with the result it became considerably damaged. The hirers sued the vehicle owners for injury to the machinery, whilst the haulage contractors countersued for detention to the lorry. It was held by the Judge that although the damage was caused by the negligence of the driver, this individual was temporarily the servant of the hirers, who were consequently responsible for his action. This decision meant that in very many instances hirers of road vehicles were unprotected against this particular hazard by their insurance policies. Most of the insurance firms concerned, however, have declared their willingness to undertake this additional risk without payment of any increased premium, providing their attention has been drawn to it. In view of this development, it would thus be doubly unfortunate if any firm should be placed at a disadvantage in the future solely by the omission to take up this action with their insurance company, especially as it can be guarded against without extra cost.

Sixpenny-Coupon System.

A very different kind of insurance question arises in connection with railway transits. As is well known, railways carry their own insurance in all cases, except a few relatively unimportant items listed under the Carriers Act of 1830, and for all goods carried at special contract, that is owner's risk and under the terms of the "damageable" note. The most important application of O.R. rates is in connection with parcels despatched by passenger train. As there is a difference of something like 50 per cent. between the ordinary parcels scale and the exceptional O.R. schedule, the bulk of packages naturally go by the cheaper table. Where valuable castings are involved the loss from breakage or other cause may be really serious, but still not to the extent which makes it worth while paying the full rate. In such instances the situation is met by outside insurance, providing some simple and quickly-applied system can be operated. The best method is that which uses stamps or coupons, one or more of which is attached to each package. On the basis of a thousand, the cost per coupon works out at 6d., and the equivalent cover thus obtained is £5. Should it happen that greater cover is necessary, all that one has to do is to add a coupon for each extra £5. The result is that for owner's risk rate plus 6d. a firm has full protection for all its passenger-train parcels. Another advantage is that in the event of damage or loss being sustained, a routine report to the insurance company brings the necessary compensation without the need for all the formalities and inquiries which necessarily occupy a claim made upon the railway. Post Office packages, too, can be dealt with in precisely the same manner except that the limit of liability is £3 instead of £5. Anyone who has experienced the trouble of making a Post Office claim will know the relief to be obtained from securing a prompt settlement through the medium of coupon insurance. As may be expected, it is necessary to keep a book record of all coupon consignments for reference and signature purposes, but apart from this the simplicity of the whole scheme is one of its chief attractions; it can, in short, be incorporated into the office routine with a minimum of either trouble or expense. With slight modification it is capable of being extended to overseas trade, thus increasing its sphere of usefulness.

Marine Insurance Eliminated.

In coastal shipping, the age-old practice of carrying all goods exclusively at owner's risk, thereby making it incumbent on the trader to take up a marine insurance policy, has been very considerably modified. Curiously enough, the cause of this change has been the railways themselves. Under the Railways Act of 1921 the common carrier's insurance liability for goods carried was extended to the *water* portion of throughout land and sea journeys, which had the effect of making railways equally liable for all stages of a combined land and water journey, whereas hitherto their responsibilities for sea transit had been limited. This requirement did not extend to the independent shipping interests, consequently, on the cross-channel routes, the railways were under a greater responsibility than their rivals. As they were not slow to turn this apparent drawback into a canvassing appeal for the benefit of the shipper of goods, it had the somewhat unexpected results of turning over more traffic to the railway steamers in order to get the "free" protection which, so far as the trader was concerned, meant no insurance premium. In self-defence, therefore, competing cross-channel carriers introduced company's risk rates, and once these quotations had been established their extension to coastwise traffic was only a matter of time. Undoubtedly this is a facility which has been greatly appreciated by industrial interests who were dependent upon coastwise shipping for their traffic. At the same time it has helped the coastwise trade to meet the increased competition of both rail and road.

Where several means of transport have got to be used in a throughout journey it is hardly practicable to go into all the various degrees and states of liability existing between one kind of conveyance and another. The simplest and most effective method is the introduction of a "warehouse to warehouse" policy, an inclusive arrangement which makes full provision not only for sea and land protection but the incidental transfers and for a stipulated period of storage within the warehouse itself.

Utilising British Pig-Iron Resources.

(*Continued from p.* 133.)

Research Association, the authors said that they were glad of that opportunity to explain that that point was raised by the junior author after the senior author, who was compiling the information received, had already proceeded a considerable way and had set out sheets for the whole table in the order which he had, as a result of careful consideration, adopted, and which was that used on the sheets sent out in the first place. Owing to the "magnitude of the tables," which it was by then seen would take far more time to prepare than had been contemplated, he had felt unable to make any alteration, both on this account and also because he had always felt—as he had made it apparent in his Paper in The Foundry Trade Journal, December 2, 9 and 16, 1926, referred to in a footnote—that cast iron was only a portion of the range of alloys with the fundamental body, iron, which began first as mild steel and so up through various "carbon" and "alloy" steels, to cast iron, where graphite was an additional diluent. As the regular analysis was originated and developed far more with steel than with cast iron, there seemed a good deal to be said for keeping in cast irons to the order used for steels, unless cast iron was to be treated as an isolated material.

It was not a serious matter, however, though the authors were quite in accord that it would be a convenience, as a saving of "much mental energy," if agreement were reached on a particular order, not for cast iron alone, but for the whole range.

Economic Conditions in Yugoslavia.—The Department of Overseas Trade has issued a report on "Economic Conditions in Yugoslavia" by Mr. H. N Stubrock (Commercial Secretary, His Majesty's Legation, Belgrade). This can be obtained from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2. (Price 1s. net.)

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REQUISITES

Trade Talk.

Messrs. John Brown & Company, Limited, Sheffield, have secured a substantial order for carriage and wagon axles for the Indian railways.

Negotiations with the Soviet Government for steel contracts are being conducted collectively by the British steelmakers through the Steel Export Association.

Messrs. Blackfriars Foundry Equipment Company, Limited, of 34-35, Norfolk Street, London, W.C.2, have recently placed upon the market a wax core vent made by the extrusion process, which contains no wick and is therefore ashless.

The British Thomson-Houston Company, Limited, are despatching to the Edison Company, of Detroit, U.S.A., a 10,000-kw. turbo-generating unit, which will operate at 3,600 r.p.m. under a steam pressure of 600 lbs. per sq. in. and a temperature of 1,000 deg. Fah.

Messrs. Alexander Stephen & Sons, Limited, Linthouse, Glasgow, have received an order to build an auxiliary schooner yacht of 150 tons for Commander Kitson. The vessel will be fitted with auxiliary Diesel engines. The Linthouse yard is about the most fully employed shipbuilding establishment on the Clyde.

The July Bulletin of the British Cast Iron Research Association announces that the following concerns have been accepted as members :—The London & North Eastern Railway Company; T. Main & Sons Pty., Limited, East Melbourne, Victoria, Australia, and Thomas White & Sons, Limited, Laigh Park, Paisley.

The Liverpool Corporation has just placed the contract for the equipment of their great new abattoir at Stanley with Messrs. J. & F. Howard, Limited, ironfounders, of Bedford, one of the associated firms of Agricultural & General Engineers, Limited. The contract will mean the employment of several hundred men for a full year.

A substantial order for mining machinery has been secured by Messrs. Mavor & Coulson, Limited, Bridgeton, Glasgow, from an American firm. The fact that the order is actually a repeat of a previous contract makes it the more gratifying. The firm have recently obtained other repeat orders from foreign firms, including Belgium, Holland, Sweden, Poland, Russia, Japan, Czecho-Slovakia, Borneo, South Africa and Canada.

Twenty million pounds sterling will be expended in Canada during each of the next three years in the execution or the completion of hydro-electric power schemes already sanctioned, states the Royal Bank of Canada in its August bulletin. British engineers and manufacturers, according to the Bank, have unique opportunities of participating in this enterprise, as heavy constructional steel, and certain kinds of machinery and electrical equipment, are lines in which the Dominion welcomes British competition.

Ailsa Shipbuilding Company, Limited, have launched from the Troon yard the single screw steamer "Starling," built for the General Steam Navigation Company, Limited, London. The vessel has a deadweight capacity of 1,600 tons, and is intended for service in the owners' Continental trade; she is specially fitted for pre-cooling fruit cargoes and for the carriage of fruit and chilled or frozen meat simultaneously. The propelling machinery consists of triple-expansion engines supplied by the builders.

The fourth vessel built by Messrs. Barclay, Curle & Company, Limited, Glasgow, for Messrs. Rafen & Loennechan, Norway, has now completed very successful trials on the Clyde. The vessel, a motor-driven oil-tanker, the "Havsten," has been built to Lloyd's highest class on the longitudinal system of framing of 9,500 tons deadweight designed for the transport of light and heavy oils. The propelling machinery consists of four-cylinder, two-cycle, Barclay, Curle-Doxford airless-injection oil-engines capable of developing over 3,000 horse power.

Although Messrs. Dorman, Long & Company, Limited, Middlesbrough, were successful with their tender of £308,250 for the construction of the new bridge over the Nile, at Cairo, to replace the existing structure at Kasr-el-Nil, owing to the uncertain situation in Egypt a final decision regarding the commencement of the work has yet to be made. There has been a change of Government in Egypt, and events have occurred which may change the whole situation. At present only the site has been chosen and nothing has been started. When work is begun, however, it will be done by Messrs. Dorman, Long & Company, Limited.

Meetings are to be convened of the holders of the first mortgage debenture stock, preference and ordinary shares, and the unsecured creditors of the Midland Iron Company, Limited, to take place on August 29, to consider a scheme of arrangement which will be subject to the approval of the High Court. In normal times the output of the works has been from 24,000 to 25,000 tons, but trade depression and severe Continental competition have made it difficult to run the works at about one-third of the capacity. In October last year a receiver and manager was appointed on behalf of the debenture-holders. It is believed that the scheme of arrangement will meet with the approval of the various classes of stock and share holders, and that manufacturing and trading will be satisfactorily continued with the help of a certain amount of capital which third parties have arranged to provide. Since a receiver and manager took control, local competition has been decreased by the closing of the puddling forges and the whole of the finished iron departments of Messrs. William Cooke & Company, Limited, of Sheffield, who deemed it impolitic to try to continue to produce finished iron profitably. During the last financial year of the Midland Iron Company, Limited, the imports of wrought-iron bars amounted to 151,390 tons and the imports of wrought-iron and steel hoops and strip to 141,966 tons, a total of 293,356 tons, which, it was estimated, would have kept fully employed eleven works similar to those of the Midland Iron Company.

Obituary.

The death occurred on August 15 of Mr. William Edgar, cashier with Messrs. Cameron & Roberton, Limited, Southbank Ironworks, Kirkintilloch. Mr. Edgar had been in the employ of the firm for many years, and was appointed cashier in 1923.

The death occurred on August 12 of Mr. Francis W. Rodger at his home in Partick, Glasgow. A native of Port Glasgow, Mr. Rodger was well known in the shipbuilding and engineering industry, and had for many years been connected with Messrs. Harland & Wolff, Limited, first at Belfast and afterwards at Glasgow.

Mr. William Edward Woodeson, a director of Messrs. Clarke, Chapman & Company, Limited, Gateshead-on-Tyne, and eldest son of Mr. W. A. Woodeson, chairman of the firm, has died in London after a long illness. Born in Gateshead in 1901, Mr. W. E. Woodeson served his apprenticeship at the Neptune Engine Works of Messrs. Swan, Hunter & Wigham Richardson, Limited, Wallsend, and graduated at Durham University in 1921-2. He gained further engineering experience in France, and joined Messrs. Clarke, Chapman & Company, Limited, in 1923, being appointed departmental manager, then general manager, and, finally, in 1929, a director of the company.

Mr. Albert Edward Seaton, chairman of Messrs. Belliss & Morcom, Limited, died on Friday, August 8. Mr. Seaton was a consulting engineer whose name was known among marine engineers throughout the world. His "Manual of Marine Engineering" has been a standard work of reference for many years, and the pocket-book known as "Seaton and Rounthwaite" and his treatise on propellers are also well known. Mr. Seaton was born at Padstow in 1848. He obtained his early engineering education at Devonport Dockyard and Keyham College. In 1872 he won the Whitworth Scholarship, and then, after serving for a short time on the late Sir Edward Reed's staff, he went to Hull to take charge of engine designs and construction at Earle's Shipbuilding Yard, where he remained for many years, finally attaining to the position of general manager and director. In 1902 Mr. Seaton opened a consulting practice in London. About the same time he became President of the Iron and Steel Trades' Insurance Association, of which he was consultant director at the time of his death. In addition, Mr. Seaton was chairman of the Technical Sub-Committee of Lloyd's Register, the British Marine Engineering Design and Construction Committee, and the Ship Machinery Section of the British Engineering Standards Association. He was a prominent member of the principal technical institutions, being a Vice-President of the Institution of Naval Architects, and also of the British Electrical and Allied Manufacturers' Association. He was a Justice of the Peace and a member of the Hertfordshire County Council.

Personal.

Sir Arthur Dorman, chairman of Messrs. Dorman, Long & Company, Limited, Middlesbrough, celebrated his 82nd birthday on Friday, August 8.

Mr. David Allan, employed in the melting department of Messrs. Stewarts & Lloyds, Clydesdale Steelworks, Mossend, fell into the casting pit. He sustained serious injury, and was removed to the Royal Infirmary, Glasgow.

Lord Kylsant has resigned the chairmanship of Messrs. Harland & Wolff, Limited, the Belfast shipbuilders, a position he has filled for the past six years. Mr. F. E. Rebbeck, one of the managing directors of the company, has been elected chairman of the board of directors in his stead.

Mr. Jas. F. Morris, chemist and metallurgist to the Witwatersrand Co-operative Smelting Works, Limited, South Africa, is at present in England. The works with which he is connected cast dies and shoes for the mines. Contact with Mr. Morris can be made by writing him c/o the London Secretary, Transvaal Chamber of Mines, 202, Salisbury House, Finsbury Circus, London, E.C.2.

Mr. Norman G. Calder has been appointed head of the drying stove department of Messrs. T. E. Gray & Company, Limited, 119, High Holborn, London, W.C.1. The appointment has been created because of the firm's rapid development in connection with the Herrmann mould and core-drying stoves. Mr. Calder is well known in the foundry industry, owing to his past positions as technical expert in connection with the exploitation of the Poumay cupola and Oehm's heating elements.

Mr. John Paton has resigned his directorship of Messrs. Guest, Keen & Nettlefolds, Limited, owing to the demands on his time in connection with other undertakings. Mr. Paton joined the board of Messrs. Guest, Keen & Nettlefolds, Limited, in January, 1919. He is chairman of Messrs. Partridge, Jones & John Paton, Limited, and a director of the Aberbeeg Collieries, Limited, and Cordes (Dos Works), Limited, Newport. Mr. T. Z. Lloyd, general manager of the screw works at Birmingham of Messrs. Guest, Keen & Nettlefolds, Limited, has been elected to succeed Mr. Paton as director of the company.

Contracts Open.

Bridlington, August 25.—Cast-iron water mains, for the Town Council. Mr. W. Thompson, waterworks engineer, Marton Road, Bridlington.

Cape Town, August 23.—Two centrifugal pumps, etc., for the Paarl Municipality. The Department of Overseas Trade. (Reference A.X. 9,996.)

Johannesburg, September 1.—Nickel-chrome steel, for the South African Railways and Harbours. The Department of Overseas Trade. (Reference A.X. 10,007.)

Johannesburg, September 15.—5,000 tons of mild steel, for the South African Railways and Harbours. The Department of Overseas Trade. (Reference A.X. 10,002.)

Johannesburg, September 29.—Two 4-ton electric portal cranes, for the South African Railways and Harbours Administration. The Department of Overseas Trade. (Reference A.X. 10,041.)

Stoke-on-Trent, August 28.—Cast-iron work, for the Corporation. The City Surveyor, Town Hall, Stoke-on-Trent.

Ystrad Mynach.—Iron and steel stores, for the Powell Duffryn Steam Coal Company, Limited. The Stores Manager, Ystrad Mynach, near Cardiff.

Reports and Dividends.

Enfield Cable Works, Limited.—Interim dividend of 10 per cent. on the ordinary shares.

Crossley Brothers, Limited.—Interim dividend of 3½ per cent. on the 7 per cent. preference shares.

Swan, Hunter & Wigham Richardson, Limited.—Interim dividend of 3 per cent. on the ordinary shares.

New Company.

Duport Foundries, Limited, 34, Waterloo Street, Birmingham.—Capital £1,000.

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The Lord Mayor of Hull (Councillor R. Richardson) opening the new Works at South Cave (E. Yorks).

Iron and Steel Markets.

Pig-Iron.

MIDDLESBROUGH.—Of outstanding importance to pig-iron consumers generally has been the announcement of the Cleveland ironmasters of the substantial and immediate reduction of current quotations which came into force on August 13. This movement, in effect, means an all-round cut of 4s. per ton on all grades of Cleveland iron, and is the first variation that has been made in local prices since March last, when a reduction of 5s. per ton was made. Since that date there has been a general fall in values, a reduction in works costs, and an intensification of competition, and the consequent underselling on Tees-side by Indian, Continental and even Midland ironmasters. But, perhaps, the final straw which turned the scale was the cut of 2s. 6d. per ton in Midland prices on July 31. Thereafter Cleveland was bound to follow suit, and in making a single cut of 4s. per ton the ironmasters are clearly inspired by the hope that consumers who are considering autumn purchases will be encouraged to contract over a period instead of continuing hand-to-mouth purchases. Whether this much desired result will be achieved remains to be disclosed, but in the meantime the decision of the ironmasters should both stimulate and stabilise markets to the advantage of consumer and producer alike. The new prices for Cleveland pig-iron are :— No. 1 foundry iron, 66s. per ton; No. 3 G.M.B., 63s. 6d.; No. 4 foundry, 62s. 6d.; No. 4 forge, 62s. per ton. Unfortunately the outlook for East Coast hematite remains far from satisfactory, and although some big sales have been recently reported, withdrawals from stock are, at the moment, comparatively light. However, the drastic curtailment of output has had some effect, for, if sales are small, prices are actually a little firmer. Makers are taking a stronger stand on the basis of 71s. per ton for mixed numbers and 71s. 6d. for No. 1 quality. On the North-West coast, Bessemer mixed numbers continue steady, and are still quoted at 70s. per ton at works.

LANCASHIRE.—Local markets for foundry pig, though still quiet, have evidenced a slightly more active tendency than of late, but in few instances have the orders placed been of good size, and the probability is that the bulk of the extra trade would have come along, in any case, after the exceptionally slack period last week. Prices, however, continue steady, with Derbyshire and Staffordshire No. 3 brands quoted at 72s. and Scotch iron at 93s. to 94s., all per ton delivered Manchester or equal.

THE MIDLANDS.—Owing to a slight improvement in demand from Black Country foundries, the market has circulated a few new orders, and a limited number of forward contracts have been given out. It may, however, be a few weeks before any real change is to be observed. Meanwhile the furnaces are quoting 70s. for Northants No. 3 and 73s. 6d. for Derbyshire and North Staffordshire No. 3, delivered local stations.

SCOTLAND.—At the moment, Scottish founders are only taking their day-to-day requirements and are not inclined to buy ahead, as they have very little work on their books. Four blast furnaces which had been damped down are in blast again, making the total operating 12, seven being on foundry iron and five on hematite. Prices are unchanged, on the basis of 76s. 6d. for No. 3 foundry, f.o.t. furnaces.

Finished Iron.

As is usually experienced at this period of the year, markets for most grades of finished material are extremely quiet, and the Black Country manufacturers are unable to secure sufficient business to warrant continuity of operation. Neither consumers nor stock merchants are ordering any appreciable quantities of crown bars, and little business is possible in connection with nut and bolt iron because of foreign competition. Staffordshire crown bars are quoted at between £10 and £10 5s., and bolt iron at from £9 to £9 5s. Staffordshire marked bars are unchanged at £12 10s. at works, and in connection with this grade of iron the Midlands continue to receive a fair measure of support.

Steel.

There is still only a very poor demand for semi-finished steel. The number of transactions reported is small, and altogether at the moment consumers seem to have very little interest in the market. The corporation which is to handle the sales of semi-finished steel in the British market has been formed. Meanwhile the pooling arrangement in connection with Continental semis continues, and the fixed prices recently decided are being quoted. In the case of sheet bars, however, some shading of prices has been taking place. In the tinplate market quotations remain stationary at 18s. basis for coke quality net cash, f.o.b. Welsh ports.

Scrap.

Markets for foundry scrap, without distinction, continue in a lifeless condition, although merchants express the view that the trade has probably touched bottom and that the next move will be in an upward direction. Certainly prices are so low that there are few keen sellers. At Middlesbrough prices are more or less nominal quotations only; ordinary qualities of heavy cast iron ruling at 55s. and good machinery quality in handy sizes at 57s. 6d. In Scotland the cast-iron scrap market is also easy, and machinery quality in pieces not exceeding 1 cwt. is indicated at around 63s., with ordinary cast-iron to the same specification at 57s. 6d. The above prices are all per ton delivered f.o.t. consumers' works.

Metals.

Copper.—Lack of interest on the part of the speculative element and absence of an active consumptive demand have had a further quietening effect upon dealings in warrant copper, and markets have continued dull and uneventful. New York advices report that the position is still rather complex. The bulk of the recent buying by domestic consumers in America was for August-September-October delivery, so that even if there prove to be a substantial decline in stocks at the end of July, too much significance must not be attached to it.

Closing quotations :—

Cash.—Thursday, £47 6s. 3d. to £47 7s. 6d.; Friday, £47 5s. to £47 7s. 6d.; Monday, £47 7s. 6d. to £47 8s. 9d.; Tuesday, £47 5s. to £47 6s. 3d.; Wednesday, £47 3s. 9d. to £47 5s.

Three Months.—Thursday, £47 7s. 6d. to £47 8s. 9d.; Friday, £47 5s. to £47 7s. 6d.; Monday, £47 8s. 9d. to £47 10s.; Tuesday, £47 5s. to £47 6s. 3d.; Wednesday, £47 6s. 3d. to £47 7s. 6d.

Tin.—Values in the market for standard tin of late have displayed considerable irregularity, but fluctuations have been on an unimportant scale and confined to narrow margins. Trade buying is rather poor, and conditions in America have been dull. There has been no further announcement in connection with the action of producers in restricting output, and yet the feeling is prevalent that restriction is now in active progress.

Official closing prices :—

Cash.—Thursday, £134 5s. to £134 10s.; Friday, £134 2s. 6d. to £136 5s.; Monday, £134 15s. to £135; Tuesday, £135 to £135 2s. 6d.; Wednesday, £134 15s. to £134 17s. 6d.

Three Months.—Thursday £136 2s. 6d. to £136 7s. 6d.; Friday, £135 17s. 6d. to £136; Monday, £136 5s. to £136 10s.; Tuesday, £136 10s. to £136 12s. 6d.; Wednesday, £136 2s. 6d. to £136 5s.

Spelter.—With large stocks in hand, prices have been difficult to maintain, although there is a growing belief that the bottom of the market has been touched and that the efforts to reorganise the cartel will be successful. According to reports, several producers in Australia have stopped producing zinc concentrates, and the San Francisco Mines of Mexico have suspended production.

Daily fluctuations :—

Ordinary.—Thursday, £15 16s. 3d.; Friday, £15 17s. 6d.; Monday, £16 1s. 3d.; Tuesday, £16 2s. 6d.; Wednesday, £16 2s. 6d.

Lead.—A fairly firm tone prevailed in this market throughout the week, owing to better conditions in America, where the leading interests have advanced the price by 15 points to 5.50 c. per lb. A more active demand was reported on the Continent, but, with the modest inquiry here readily met, values were no more than steady at the close.

The week's prices have been :—

Soft Foreign (Prompt).—Thursday, £18 5s.; Friday, £18 3s. 9d.; Monday, £18 6s. 3d.; Tuesday, £18 7s. 6d.; Wednesday, £18 5s.

Students' Corner.

Q.—Are there many mishaps in the foundry due to irregularities in contraction ?

A.—They are numerous, not only from faulty design, but also from poor foundry practice. Many castings develop cracks and ruptures through inherently impeding contraction, also from a failure to remove obstacles which retard contraction.

Q.—Can contraction stresses be estimated ?

A.—There are no means readily available for estimating a contraction stress. Some instances have occurred where a contraction stress has existed, and later fractured the casting, yet the power required to do this was extremely high.

Q.—Do contraction stresses exist in castings after they are cold ?

A.—Quite often they do, and on many occasions castings have fractured into two or more pieces after being cold. It is no rare occurrence for castings even of a very plain type to crack after being made for weeks, or even months.

Q.—Can such behaviour be explained ?

A.—Not unless the history of the casting is known, such as quality of metal used, casting temperature, casting temperature when partly stripped and also when lifted out of the sand. In the case of a large casting, it should be ascertained whether it was put where a draught or cold wind was playing, whether rain or other moisture could come into contact with it; the treatment it would receive when being dressed, etc. Any one of the above may be quite sufficient to cause rupture, omitting the important question of design.

In most cases the fault has been caused by stripping the casting when too hot, or lifting it out of the sand when too hot; these are the most prolific causes.

Some castings, weighing many tons, and of the stanchion type, which may be described as "plain as a brick," when lifted out of the sand when hot and rested on the floor near a doorway where a slight draught was playing on one side of it, after a couple of hours have cracked right through.

Buoy-sinkers, or anchors—a plain oval casting about 11 in. thick and weighing 3 tons—have split through the centre during a summer night after being cast three weeks.

The cure in these cases was apparent, as it was known that in every case the castings were lifted out of the sand very hot.

Oily Leather Belting.—Belting which has become saturated with oil may be successfully treated as follows:—Cover the surface of the belt (doing a little at a time) with fuller's earth to a depth of ¼ in. or more, and leave on for a few hours. The fuller's earth will absorb the oil and may then be scraped off. Four or five similar operations should finish the whole belt of any average drive.

Sterling

SOLID RIBBED ROLLED STEEL
MOULDING BOXES

are recognised as standard box equipment by the leading foundries and engineering establishments in this country and overseas.

Because they speed up production, save unnecessary labour, produce accurate castings and make for all-round efficiency in the foundry.

STERLING BOXES WILL SAVE THEIR COST IN A FEW MONTHS.

WRITE FOR CATALOGUE No. 37.

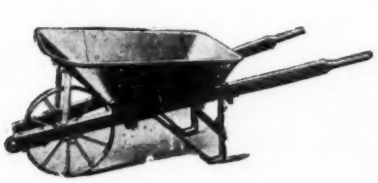
Sterling

FOUNDRY BARROWS

for

SAND, COKE, and PIG-IRON

are sturdily built to withstand the heavy duties and harsh treatment of the severest foundry service.



STERLING FOUNDRY SPECIALTIES LTD.

London Office:
13, VICTORIA STREET, S.W.1.

BEDFORD.

Telephone: 3345 BEDFORD.
Telegrams: "STERFLASK, BEDFORD."
Code: WESTERN UNION.

Glasgow: ALBERT SMITH & CO., 60, ST. ENOCH SQUARE, GLASGOW, C.1.
Newcastle-on-Tyne: LAWSON, WALTON & CO., LTD., HANDYSIDE ARCADE, NEWCASTLE-ON-TYNE.
Manchester: F. L. HUNT & CO., CHAPEL STREET, SALFORD, MANCHESTER.

WEEKLY PRICE CURRENT.

COPPER.

	£	s.	d.
Standard cash	47	3	9
Three months	47	6	3
Electrolytic	50	10	0
Tough	49	10	0
Best selected	50	0	0
Sheets	79	0	0
India	63	0	0
Wire bars	52	2	6
Do. September	52	2	6
Do. October	52	2	6
Ingot bars	52	2	6
H.C. wire rods	53	10	0
Off. av. cash, July	48	6	10¼
Do., 3 mths., July	48	0	7 12/25
Do., Sttlmnt., July	48	7	6
Do., Electro, July	53	7	6
Do., B.S., July	53	1	4½
Do., wire bars, July	54	4	6 13/25
Solid drawn tubes			11½d.
Brazed tubes			11½d.
Wire			8¼d.

BRASS.

Solid drawn tubes	10½d.
Brazed tubes	12½d.
Rods, drawn	10½d.
Rods, extd. or rlld.	6½d.
Sheets to 10 w.g.	8½d.
Wire	8½d.
Rolled metal	8½d.
Yellow metal rods	6½d.
Do. 4 × 4 Squares	7d.
Do. 4 × 3 Sheets	7½d.

TIN.

	£	s.	d.
Standard cash	134	15	0
Three months	136	2	6
English	136	5	0
Bars	138	5	0
Straits	136	7	6
Australian	135	15	0
Eastern	140	10	0
Banca	139	0	0
Off. av. cash, July	134	11	10 5/25
Do., 3 mths., July	136	6	5 13/25
Do., Sttlmt., July	134	12	4 13/25

SPELTER.

	£	s.	d.
Ordinary	16	2	6
Remelted	15	0	0
Hard	12	10	0
Electro 99.9	18	7	6
English	16	10	0
India	14	10	0
Zinc dust	22	0	0
Zinc ashes	4	0	0
Off. aver., July	16	9	5 7/8
Aver., spot, July	16	3	5 2/13

LEAD.

	£	s.	d.
Soft foreign ppt.	18	5	0
English	19	15	0
Off. average, July	18	2	2 17/25
Average spot, July	18	3	2 1/13

ZINC SHEETS, &c.

	£	s.	d.
Zinc sheets, English	26	0	0
Do. V.M. ex-whf.	25	5	0
Rods	30	0	0
Boiler plates	21	0	0
Battery plates	22	10	0

ANTIMONY.

	£	s.	d.
Special brands, Eng.	38	0	0
Chinese	27	0	0
Crude	21	0	0

QUICKSILVER.

	£	s.	d.
Quicksilver	22	10	0

FERRO-ALLOYS AND STEEL-MAKING METALS.

Ferro-silicon—	
25%	£7 17 6
45/50%	£11 10 0
75%	£18 10 0
Ferro-vanadium—	
35/50%	12/8 lb. Va.
Ferro-molybdenum—	
70/75% c. free	4/2 lb. Mo.
Ferro-titanium—	
23/25% carbon-free	11½d. lb.
Ferro-phosphorus, 20/25%	£16 0 0
Ferro-tungsten—	
80/85%	2/3 lb.
Tungsten metal powder—	
98/99%	2/6 lb.
Ferro-chrome—	
2/4% car.	£30 10 0
4/6% car.	£23 10 0
6/8% car.	£22 7 6
8/10% car.	£22 0 0
Ferro-chrome—	
Max. 2% car.	£33 10 0
Max. 1% car.	£37 15 0
Max. 0.70% car.	£42 7 6
70% carbon-free	11d. lb.
Nickel—99% cubes, or pellets	£175 0 0
Ferro-cobalt	9/7 lb.
Aluminium 98/99%	£95 0 0
Metallic chromium—	
96/98%	2/7 lb.
Ferro-manganese (net)—	
76/80% loose	£11 0 0 to £11 15 0
76/80% packed	£12 0 0 to £12 15 0
76/80% export	£11 0 0 to £11 15 0
Metallic manganese—	
94/96% carbonless	1/4 lb.

Per ton unless otherwise stated.

HIGH-SPEED TOOL STEEL.

Finished bars, 14% tungsten	£0 2 2
Finished bars, 18% tungsten	£0 3 0

Per lb. net, d/d buyers' works.

Extras—	
Rounds and squares, 3 in. and over	4d. lb.
Rounds and squares, under ½ in. to ¼ in.	3d. lb.
Do., under ¼ in. to 1/8 in.	1/- lb.
Flats, ½ in. × ¼ in. to under 1 in. × ½ in.	3d. lb.
Do., under ½ in. × ¼ in.	1/- lb.
Bevels of approved sizes and sections	6d. lb.

Bars cut to length, 10% extra.

SCRAP.

South Wales—	£	s.	d.	£	s.	d.
Heavy steel				2	15	0
Bundled steel and shrngs.	2	10	0	to 2	13	0
Mixed iron and steel	2	7	6	to 2	10	0
Heavy cast iron	2	13	0	to 2	14	0
Good machinery for foundries	2	15	0	to 2	17	6
Cleveland—						
Heavy steel				2	7	6
Steel turnings				2	0	0
Cast-iron borings				1	15	0
Heavy forge				3	7	6
W.I. piling scrap				3	3	0
Cast-iron scrap	2	15	0	to 2	17	6
Midlands—						
Ord. cast-iron scrap				2	12	6
Heavy wrought				3	5	0
Steel turnings				1	7	0
Scotland—						
Heavy steel				2	10	0
Ordinary cast iron				2	17	6
Engineers' turnings				1	16	0
Cast-iron borings				1	11	0
Wrought-iron piling				3	7	6
Heavy machinery				3	3	0

London—Merchants' buying prices delivered yard.

	£	s.	d.
Copper (clean)	43	0	0
Brass	32	0	0
Lead (less usual draft)	15	15	0
Tea lead	12	10	0
Zinc	9	10	0
New aluminium cuttings	56	0	0
Brazier copper	40	0	0
Gunmetal	42	0	0
Hollow pewter	100	0	0
Shaped black pewter	75	0	0

PIG-IRON.

(f.o.t. unless otherwise stated.)

N.E. Coast—	
Foundry No. 1	66/-
Foundry No. 3	63/6
Foundry No. 4	62/6
Forge No. 4	62/-
Hematite No. 1	71/6
Hematite M/Nos.	71/-
N.W. Coast—	
Hem. M/Nos. d/d Glas.	81/6
d/d Birm.	88/6
Midlands—	
Staffs. common*	—
No. 4 forge*	68/6
No. 3 fdry.*	73/6
Shrops. basic	—
Cold blast, ord.	—
roll iron	—
Northants forge*	65/-
fdry. No. 3*	70/-
Derbyshire forge*	68/6
fdry. No. 3*	73/6
basic*	—

*d/d Black Country dist.

Scotland—	
Foundry No. 1	79/-
No. 3	76/6
Hem. M/Nos.	78/6
Sheffield (d/d district)—	
Derby forge	63/6
fdry. No. 3	68/6
Lincs. forge	—
fdry. No. 3	70/-
E.C. hematite	83/6
W.C. hematite	86/6
Lincs. (at furnaces)—	
Forge No. 4	—
Foundry No. 3	—
Basic	—
Lancashire (d/d eq. Man.)—	
Derby forge	67/-
fdry. No. 3	72/-
Staffs foundry No. 3	72/-
Dalzell, No. 3 (special)	105/- to 107/6
Summerlee, No. 3	93/- to 94/-
Glengarnock, No. 3	—
Eglinton, No. 3	93/- to 94/-
Gartsherrié, No. 3	93/- to 94/-
Monkland, No. 3	93/- to 94/-
Shotts, No. 3	93/- to 94/-

FINISHED IRON AND STEEL.

Usual District deliveries for iron; delivered consumers' station for steel.

Iron—	£	s.	d.	£	s.	d.
Bars (cr.)				10	15	0
Nut and bolt iron	9	0	0 to	9	5	0
Hoops				10	15	0
Marked bars (Staffs) f.o.t.				12	10	0
Gas strip				10	15	0
Bolts and nuts, ¼ in. × 4 in.				15	5	0
Steel—						
Ship plates	8	15	0 to	8	17	6
Boiler plts.	9	15	0 to	10	10	0
Chequer plts.				10	12	6
Angles				8	7	6
Tees				9	7	6
Joists				8	10	0
Rounds and squares, 3 in. to 5½ in.				9	7	6
Rounds under 3 in. to ¼ in. (Untested)				7	15	0

and upwards

Flats—8 in. wide and over	8 12 6
,, under 8 in. and over 5 in.	8 17 6
Rails, heavy	8 10 0
Fishplates	12 0 0
Hoops (Staffs)	9 5 0 to 9 15 0
Black sheets, 24 g.	9 12 6 to 9 15 0
Galv.cor.shts., 24g.	11 17 6
Galv. fencing wire, 8g. plain	12 0 0
Billets, soft	5 17 6 to 6 5 0
Billets, hard	7 10 0 to 8 0 0
Sheet bars	5 12 6 to 6 0 0
Tin bars	6 0 0

PHOSPHOR BRONZE.

	Per lb. basis.
Strip	1/0½
Sheet to 10 w.g.	1/1½
Wire	1/1½
Rods	1/1
Tubes	1/5½
Castings	1/1½

Delivery 3 cwt. free.
10% phos. cop. £30 above B.S.
15% phos. cop. £35 above B.S.
Phosphor tin (5%) £30 above price of English ingots.
C. Clifford & Son, Limited.

NICKEL SILVER, &c.

	per lb.
Ingots for raising	8d. to 1/2
Rolled—	
To 9 in. wide	1/2 to 1/8
To 12 in. wide	1/2½ to 1/8½
To 15 in. wide	1/2½ to 1/8½
To 18 in. wide	1/3 to 1/9
To 21 in. wide	1/3½ to 1/9½
To 25 in. wide	1/4 to 1/10
Ingots for spoons and forks	8d. to 1/4½
Ingots rolled to spoon size	11d. to 1/7½
Wire round—	
3/0 to 10 G.	1/5½ to 2/0½

with extras according to gauge.

AMERICAN IRON AND STEEL.

At Pittsburgh unless otherwise stated.

	Dols.
No. 2 foundry, Phila.	19.76
No. 2 foundry, Valley	18.00
No. 2 foundry, Birm.	14.00
Basic	19.76
Bessemer	20.26
Malleable	20.26
Grey forge	19.26
Ferro-mang. 80%	94.00
O.-h. rails, h'y, at mill	43.00
Billets	31.00
Sheet bars	31.00
Wire rods	36.00
	Cents.
Iron bars, Phila.	2.09
Steel bars	1.65
Tank plates	1.65
Beams, etc.	1.65
Skelp, grooved steel	1.70
Skelp, sheared steel	1.70
Steel hoops	1.95
Sheets, black, No. 24	2.45
Sheets, galv., No. 24	3.10
Sheets, blue an'l'd, No. 13	2.15
Wire nails	2.05
Plain wire	2.30
Barbed wire, galv.	2.80
Tinplates, 100-lb. box	$5.25

COKE (at ovens).

Welsh foundry	25/- to 27/6
,, furnace	17/- to 22/-
Durham and Northumberland—	
,, foundry	14/6 to 15/-
,, furnace	14/- to 14/6
Midlands, foundry	—
,, furnace	—

TINPLATES.

f.o.b. Bristol Channel ports.

I.C. cokes	20×14 box		18/-
,,	28×20 ,,		36/-
,,	20×10 ,,		26/-
,,	18½×14 ,,		18/9
C.W.	20×14 ,,		16/6
,,	28×20 ,,		33/6
,,	20×10 ,,		23/6
,,	18½×14 ,,		17/-
Terneplates	28×20		32/6 per box basis f.o.b.

SWEDISH CHARCOAL IRON & STEEL.

Pig-iron	£6	0	0	to	£7	10 0
Bars, hammered, basis	£17	10	0	to	£18	10 0
Bars and nail-rods, rolled, basis	£15	17	6	to	£16	15 0
Blooms	£10	0	0	to	£12	0 0
Keg steel	£32	0	0	to	£33	0 0
Faggot steel	£20	0	0	to	£24	0 0
Bars and rods dead soft, steel	£11	0	0	to	£14	0 0

All per English ton, f.o.b. Gothenburg.

TUBES AND FITTINGS.

Over ½ in. up to 6 in.

	Tubes.	*Fittings.*
Gas	62½%	47½%
Water ..	58½%	42½%
Steam ..	55%	37½%

W.I. 12½% extra.

DAILY FLUCTUATIONS.

Standard Copper (cash).

		£	s.	d.		
Aug.	14 ..	47	6	3	dec.	3 9
,,	15 ..	47	5	0	,,	1/3
,,	18 ..	47	7	6	inc.	2/6
,,	19 ..	47	5	0	dec.	2/6
,,	20 ..	47	3	9	,,	1/3

Electrolytic Copper.

		£	s.	d.		
Aug.	14 ..	51	0	0	No change	
,,	15 ..	50	10	0	dec.	10/-
,,	18 ..	50	10	0	No change	
,,	19 ..	50	10	0	,,	,,
,,	20 ..	50	10	0	,,	,,

Standard Tin (cash).

		£	s.	d.		
Aug.	14 ..	134	5	0	dec.	7/6
,,	15 ..	134	2	6	,,	2/6
,,	18 ..	134	15	0	inc.	12/6
,,	19 ..	135	0	0	,,	5/-
,,	20 ..	134	15	0	dec.	5/-

Tin (English ingots).

		£	s.	d.		
Aug.	14 ..	135	10	0	dec.	10/-
,,	15 ..	135	10	0	No change	
,,	18 ..	136	5	0	inc.	15/-
,,	19 ..	136	5	0	No change	
,,	20 ..	136	2	6	dec.	2/6

Zinc Sheets (English).

		£	s.	d.		
Aug.	14 ..	26	0	0	No	change
,,	15 ..	26	0	0	,,	,,
,,	18 ..	26	0	0	,,	,,
,,	19 ..	26	0	0	,,	,,
,,	20 ..	26	0	0	,,	,,

Spelter (ordinary).

		£	s.	d.		
Aug.	14 ..	15	16	3	dec.	1/3
,,	15 ..	15	17	6	inc.	1/3
,,	18 ..	16	1	3	,,	3/9
,,	19 ..	16	2	6	,,	1/3
,,	20 ..	16	2	6	No change	

Lead (English).

		£	s.	d.		
Aug.	14 ..	19	10	0	No change	
,,	15 ..	19	10	0	,,	,,
,,	18 ..	19	15	0	inc.	5/-
,,	19 ..	19	15	0	No change	
,,	20 ..	19	15	0	,,	,,

Exports of Iron Castings in July and the seven months 1930, compared with July and the seven months 1929.

	July, 1929.	July, 1930.	Seven months, 1929.	Seven months, 1930.	July, 1929.	July, 1930.	Seven months, 1929.	Seven months, 1930.
BUILDERS' CASTINGS—	Tons.	Tons.	Tons.	Tons.	£	£	£	£
Stoves, grates, etc., cisterns, baths, etc., and cooking and washing boilers—								
To Argentine Republic	154	142	1,265	1,315	4,956	9,605	58,090	58,877
,, British South Africa	268	313	2,115	1,400	9,892	11,328	75,446	55,000
,, ,, India	157	146	1,011	933	5,547	5,397	38,815	34,424
,, Australia	87	8	442	231	3,470	362	25,427	13,525
,, New Zealand	107	74	817	627	6,086	3,763	52,580	36,548
,, Other Countries	963	846	5,920	5,901	45,872	37,155	270,534	265,283
Total	1,736	1,529	11,570	10,407	75,823	67,610	520,892	463,657
PIPES AND FITTINGS—CAST—								
To Argentine Republic	2,205	1,431	15,897	9,976	18,808	14,281	150,850	97,432
,, British South Africa	356	592	4,223	4,856	5,917	7,209	55,190	55,169
,, ,, India	366	241	2,800	2,022	7,497	4,949	37,997	31,096
,, Straits Settlements and Malay States	3,317	1,485	14,758	4,682	23,346	11,862	107,280	41,885
,, Ceylon	55	67	1,232	910	856	697	12,839	9,202
,, Australia	117	51	2,751	561	2,189	1,110	29,531	10,258
,, Other countries	5,185	5,210	34,772	47,522	67,262	66,929	428,081	545,061
Total	11,601	9,077	76,433	70,529	125,875	107,037	821,768	790,103
HOLLOW-WARE—								
Cast, not Enamelled, and Cast, Tinned	379	360	2,711	2,466	14,484	12,110	98,462	79,893
,, Enamelled	105	107	528	482	10,062	8,854	47,264	41,786
CASTINGS, in the rough—								
Iron	252	195	924	1,450	8,981	6,472	33,237	44,342
Steel	133	161	666	1,298	5,416	6,006	27,817	51,992

WILLIAM JACKS & COMPANY,

WINCHESTER HOUSE, OLD BROAD ST., LONDON, E.C.2.

18, BENNETTS HILL, BIRMINGHAM.

PIG

IRON

All grades FOUNDRY, HEMATITE, BASIC, SPECIALS, &c.

NON-FERROUS METALS

COPPER, TIN, LEAD, SPELTER, ANTIMONY, CHROME ORE.

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